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About Authors

● B. B. Bachman *(L.M. '10) joined Autocar back in 1905 when that company made passenger cars exclusively. Since then he has been, successively, assistant engineer, chief engineer and vice-president in charge of engineering. He was elected to the latter post, which he now holds, in 1929. He has long been active in the work of the SAE and held the office of president in 1922. It was during his administration that the first production session of the SAE was held. He was chairman of the Society's Standards Committee from 1918 to 1922. As a member of the Truck Standards Division he participated in the formulation of specifications for military trucks for the Army and in the design of military trucks. Mr. Bachman was born and educated in Philadelphia, taking his engineering courses at night at the University.*

● J. E. Hale *(M '13), since graduating from M.I.T. in 1908, has spent all but a couple of years of his career as a tire development engineer. His first efforts were directed toward improving solid tires for motor trucks and, as a result, the conventional channel base, pressed-on, solid tire that has been used ever since was evolved. In the early '20's he was instrumental in bringing out balloon tires, now in universal use. Later he visualized the fundamental characteristics necessary to make low-pressure tires successful on agricultural tractors. He also introduced the super-giant pneumatic tires for dirt hauling units. Mr. Hale has been active in the work of the SAE and has had a prominent part in the Tire & Rim Association's standardization activities. He is now manager of the Firestone Tire & Rubber Co.'s development department.*

● R. V. Hutchinson *has had technical experience in several fields. After devoting several years to the design, building and maintenance of heavy machinery, blast-furnace and rolling-mill equipment, he joined the Dayton Wright Airplane Co. as assistant to the chief engineer. Later he went with the General Motors Research Laboratories at Dayton as assistant to the chief mechanical engineer. He followed this with three years as manufacturing en-*

(Continued on page 32)

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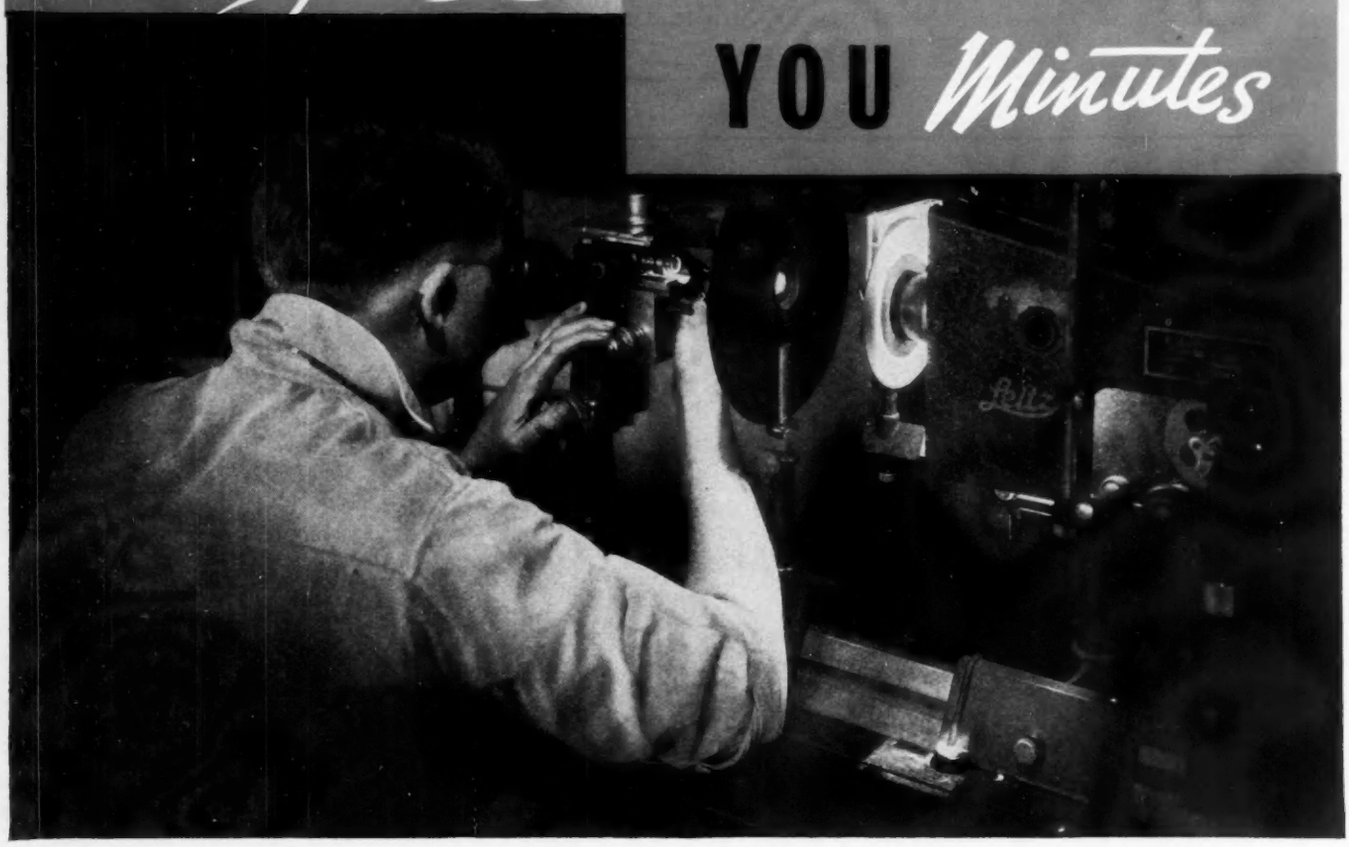
WHAT TOOK US *Years* ... WILL TAKE YOU *Minutes*



● You can't learn all of the known intricacies of steel in a few minutes. It takes years . . . years of research and experimentation in the laboratory . . . years of work in every class of industry with manufacturers of every type of steel-using equipment . . . long years which cost many millions of dollars.

But you can in a few minutes learn from Republic metallurgists just what steels will best serve your various needs at lowest cost. For back of these men are the years of experience and at their disposal are the carbon, special requirement and alloy steels that have made Republic Steel first choice of large and small steel users.

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Your Society

THIS is the first article of a series on "Your Society."

Tradition . . . a constitution . . . by-laws . . . authorities and functions delegated to committees . . . members . . . officers . . . a thousand and one elements combine to make the entity known as Society of Automotive Engineers.

This series aims to bring alive every phase of Society functioning as related to the individual member; to appraise the interrelationships of its various parts; and to familiarize members with the theory and practice of its operation.

Philip H. Smith, contributing editor to *Scientific American*, author of two papers presented before the SAE last year, and widely known as a writer on industrial phases of technical progress, was chosen by the Publication Committee to analyze the Society's functioning and to interpret it as it appeared to an informed outsider.

The result is an intriguing story of "Your Society."

By Philip H. Smith

"THERE is a limit to the quantity (of automobiles) that this or any other country can absorb, and we are inclined to advise conservatism in the planning of production."

So wrote the president of the Knox Automobile Co. in 1905, to express the opinion of a majority of persons, many of them working within the infant business of producing horseless buggies. But there were at least six men with broader vision of the future because that number had come together a year prior to found the Society of Automobile Engineers. They had declared for a coming industry with immediate needs and greater needs in the future.

Need – that is the animating idea which gave rise to the Society and made it what it is today. Whatever tracing back one may do; whatever explanation is required, can be found in the satisfaction of needs. No division, no committee nor function exists merely as a caprice; each and all serve a distinct purpose.

The Society of Automotive Engineers represents an intricate organization web. Strand after strand has been woven into it, paralleling a similar weaving operation by which the automotive industry has come to its present state of being. If you wish to say that the development of the automobile created the SAE, no one can deny it. If you prefer to think that the Society shaped the industry, that, too, cannot be denied. Either view affords a reflection of the other organization.

But to get back to a consideration of needs and the strand formation which pictures the Society today. There have been two major factors influencing Society growth since its founding. We might term the first, external pressures – technical and economic. Then there are the internal pressures coming from an acceptance of the external. Put in a slightly different way: technical or economic development creates the need for, say, standards. That need is recognized and a standards committee is formed with a resultant expansion in the activities of the Society. Then, in turn, standards activities must be broken down into detailed studies which stimulates a growth of specialized standards work.

It becomes obvious, after a little thought, that the Society's function begins in generalities and moves on to the specific. And two forces are always at work, one which is centripetal, drawing together diverse activities under the Society's wing, and the opposing force, which, in the cultivation of the activity, is dispersing, or centrifugal. Having the two makes for tension and growth.

Centripetal force gave rise to the Society. There was need to bring together scattered knowledge about the motor car where it could be of benefit to the industry as a whole, if we can flatter by using "industry" so early. Hence the very first work of the Society was that of serving as a coordinator, rapidly followed by the detailed work of creating standards.

The Association of Licensed Automobile Manufacturers organized a Mechanical Branch in 1904 to begin standardization, but the benefits were closely held for its exclusive membership. Six years later this work was taken over by the SAE to avoid duplication of effort and to disseminate findings in a truly democratic fashion.

As the automobile grew in complexity, standardization work grew, and out of it sprang quickly the need for research. The first Research Division of the Standards Committee, organized in 1914, was quite unlike the research of today. It was formed to survey the field to determine where standards work was needed, and what should be standardized. When the Society continued to grow and to absorb more and more allied interests, there came a day when more comprehensive research activities were needed. In 1921, therefore, a Research Department was organized to coordinate the work of existing bodies and to serve as a clearing house.

Here we have an explanation of the present broad scope of standards and research work. Both technical and economic pressures produced the Research Department. The disorganization following the War introduced manifold problems. There was, for example, the problem of getting proper performance from engines operating on the fuel of that day. And the first step of the newly formed Department was to join forces with the American Petroleum Institute in the search for a solution.

Standards Difficulties Overcome

Today we think that standards work is essential and of inestimable benefit. It has proved to be so. But when it was first undertaken there was no such unanimity in the belief that it had merit. One of the earliest efforts, having to do with steel, met with no little opposition. Steel makers had given the automobile industry what it had handy to sell and it resented any dictation or assumption of superior knowledge by an outside party. Again, parts standardization was frowned upon. Parts makers felt that reducing the number of types and sizes would simplify production and make it very easy for competition to get a foothold.

We have said that the Society expanded as the result of two influencing forces. The centripetal, or the reaching out to include other interests, is illustrated by the inclusion of the Society of Aeronautic Engineers and the Society of Tractor Engineers in the year 1916. At that time the word "Automobile" in the Society's name was changed to "Automotive," indicative of the broadened scope of activity. Emphasis shifted from the automobile as such, to the motive power, because it was recognized that the organization really pivoted about the internal combustion engine. No stretching of the imagination nor revision of the Constitution was required, therefore, to embrace the engineering functions of the National Gas Engine Association and the National Association of Engine and Boat Manufacturers a few years later.

This inclusion of allied interests increased the importance of the Society by expanding the scope of its work. And, too, because each allied interest possessed specific problems which could not be handled by fitting in to existing working units. The organization set-up had to be expanded to meet these new needs.

The centrifugal forces were created mainly by the development of the automotive industry. Here we use the word "centrifugal" to mean the development of specific and often delimited interests within the boundaries of the industry as represented by the Society as a whole. When the specific interest emerged it had to be accorded recognition if the Society were to continue to function for the best interests of the whole. This very understandable development coming from automotive expansion began as a ripple before it culminated in a wave. For instance, the depression of 1920 and 1921 had stimulated a need for greater economies in production and so we find the first national production meeting taking place in the following year. This was followed closely by the formation of a Service Committee and a Service Meeting, and later a Transportation Meeting. All these acts represented recognition of new interests which had grown to sufficient importance to warrant special attention.

Production Standards in 1926

Production was accorded further recognition in 1926 when a Production Division of the Standards Committee was formed. Its function was the formulation of standards and the outlining of recommended production practice, which was a departure, since hitherto standards had dealt with design and practice as they referred to the product.

When the wave of specific interests broke in 1929 we find recognition of "professional activities," themselves a centripetal force, treated centrifugally by giving each activity representation upon the Council, through the offices of a vice-president representing the Activity.

The expansion of the Society, making it what it is today – an organization serving the manifold needs of the automotive industry – can be traced along many channels. Consider the membership, for example. The first membership was exclusively engineers. Then came the affiliate membership six years after founding, by which the companies wishing to benefit by the deliberations of the Society could do so. In 1911 the associate membership came into being, which made it possible for non-engineers to share in the Society's progress. And then, after five years had elapsed, came the service members. Every type of membership from the Juniors which reaches down to get the engineer of the future, to the regular membership, has as its purpose strengthening the work of the Society and giving its benefits where they can best serve the automotive industry.

SAE Journal Grew from *Bulletin*

The publications of the Society also tell a story of growth induced by meeting needs. The JOURNAL was not always what it is today. It is an outgrowth of the BULLETIN which it superseded in 1911. The BULLETIN began as a mimeographed sheet and grew up to need type. Then, when the BULLETIN was completely outmoded, came the JOURNAL. Early in the life of the Society, standards comprised the major work. As quickly as they were set they appeared in a data book. But the loose-leaf publication too often became a lost-leaf compilation, so the present bound HANDBOOK, so familiar to members, came into being. While these changes were taking place to make the work of the Society more readily available to its members, the TRANSACTIONS simply went ahead and grew fatter. If you should examine the 31 years of this publication, the full life and expansion of the Society will stand revealed.

Every member of the Society knows that the organization is composed of Sections, but that was not always true. The creation of Sections first began in 1911 with New York, Detroit and Philadelphia. It provided the means for greater group activity. Yet it was a momentous step, viewed in retrospect, because it set up semi-autonomous bodies within the Society. It was a "must" because urged by the members as a means for accentuating the value of the Society. Much of the vitality of the Society today comes from the 22 Sections, since within each Section is the mechanism for exercising group activity.

Of course the growth and proliferation of organization activity has put a strain on the Constitution more than once, but it has been amended again and again to make it serve the

need of the times. Like the shirt of a growing man, the Constitution which cloaks the Society has been re-cut once and re-enforced at the seams on several occasions. The first Constitution was assembled from pieces cut from similar documents guiding other Societies. In 1908 a new one was written, patterned after that of the American Society of Mechanical Engineers. Following many amendments, the last big alteration came in 1929 to permit representation of Professional Activities upon the Council. Each amendment gave cognizance of new demands, new needs, and opened the way to satisfy them.

No survey of the Society in its entirety would be complete without some reference to its cooperation with other organizations in standards and research work. In the sense that it has recognized where its interests have impinged upon the interests of other groups and has cooperated with them in joint work, it has been able to progress without going too far from its own center. Thus we find that it has maintained contact with such diverse groups as the Bureau of Standards, Bureau of Public Roads, the Automobile Manufacturers Association, American Petroleum Institute, and a host of others. Coordinating is the practice of buttoning up, and the Society has pursued it consistently since the days when the automobile itself buttoned up the back.

SAE *Coming* EVENTS

Baltimore—March 3

Longfellow Hotel; dinner 6:30 P.M. March of Progress in Transportation – Pierre Schon, transportation engineer, Yellow Truck & Coach Mfg. Co.

Buffalo—March 22

Hotel Statler; dinner 6:30 P.M. Newer Sources of Motor Fuel – Dr. Gustav Egloff, director of research, Universal Oil Products Co. This will be a joint meeting with the American Chemical Society.

Canadian—March 16

Royal York Hotel, Toronto; dinner 7:00 P.M. Recent Developments in Highway Engineering – R. M. Smith, deputy minister of highways for the Province of Ontario.

Chicago—March 8

Medinah Club; dinner 6:30 P.M. Ladies' Night Address by Dr. T. C. Poulter on Experiences in the Antarctic. Doctor Poulter is the recipient of the Congressional Medal for Scientific Accomplishment Unequalled in Polar Research. He was Second in Command of the Byrd Antarctic Expedition.

Cleveland—March 14

Cleveland Club; dinner 6:30 P.M. Use of Rubber in the Automotive Industry – F. L. Haushalter, development engineer, B. F. Goodrich Co.; New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Corp., and president SAE.

Detroit—March 14

Hotel Statler; meeting 8:00 P.M. The Cadillac V-16 Engine – C. B. Crockett. The Detroit Section will also participate in the National Passenger-Car Meeting of the Society, to be held in Detroit, March 28-30, in the Hotel Statler. *(See page 20).*

Indiana—March 10

Antlers Hotel, Indianapolis; dinner 6:30 P.M. Aviation Meeting.

Kansas City—March 4

Hotel Kansascitian. Afternoon session 2:00 P.M.; dinner 6:30 P.M. Effect of Pressures up to One and a Half Million Pounds – Dr. T. C. Poulter, director Research Foundation, Armour Institute of Technology, and recipient of the Congressional Medal for Scientific Accomplishment in Polar Research. Hypoid Lubricants – C. F. Prutton, professor of chemical engineering, and A. O. Willey, assistant professor of mechanical engineering, Case School of Applied Science. Characteristics of Tomorrow's Lubricants, Sources and Technology of Super-Lubricants – A. L. Foster, technical editor, *National Petroleum News*. Engine Deposits – C. M. Larson, chief consulting engineer, Sinclair Refining Co.

Metropolitan—March 7

The Roger Smith; 40 E. 41st St., New York City. Dinner and reception to the Council of the Society, 6:30 P.M. Address by Lowell Thomas.

Milwaukee—March 4

University of Wisconsin, Madison. Afternoon demonstrations by students covering gas and Diesel engines. Dinner and meeting in the evening.

New England—March 17

Engineers Club, Boston, Mass.; dinner 6:30 P.M. New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Co., and president SAE; Truth Through Torture – John A. C. Warner, secretary and general manager, SAE.

Northern California—March 8

Athens Athletic Club, Oakland; dinner 6:30 P.M. Report of Annual Meeting and surprise paper.

Northwest—March 4

University of Washington, Seattle; dinner at the "Commons" on the Campus. Meeting will be held in the new wind tunnel at the University, with an address by Professor Kirsten.

Philadelphia—March 8

Engineers Club; dinner 6:30 P.M. Oil Filters – James I. Clower, associate professor of machine design, Virginia Polytechnic Institute; New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Co., and president SAE.

Pittsburgh—March 15

Webster Hall; dinner 6:30 P.M. New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Co., and president SAE. An address will also be given by J. E. Hale, manager, development department, Firestone Tire & Rubber Co.

Southern California—March 19

Hollywood Roosevelt Hotel, Los Angeles; dinner 6:30 P.M. Social night – dinner and dance.

Southern New England—March 16

Bond Hotel, Hartford, Conn.; dinner 6:30 P.M. Magnetic Testing of Materials – Messrs. Allison, Hewit and Noble. New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Co. and president, SAE; Truth Through Torture – John A. C. Warner, secretary and general manager SAE.

Syracuse—March 28

Onondaga Hotel; dinner 6:30 P.M. Motor-Vehicle Fleet Operation – F. K. Glynn, engineer, American Telephone & Telegraph Co.

Washington—March 9-11

Mayflower Hotel, Washington, D. C. Participation in the National Aeronautic Meeting of the Society.

National Aeronautic Meeting

March 10-11 Washington, D. C.
Mayflower Hotel
(See page 19)

National Passenger Car Meeting

March 28-30 Detroit
Hotel Statler
(See page 20)

National Tractor Meeting

April 14-15 Milwaukee, Wis.
Schroeder Hotel

Section Regional Transportation and Maintenance Meeting

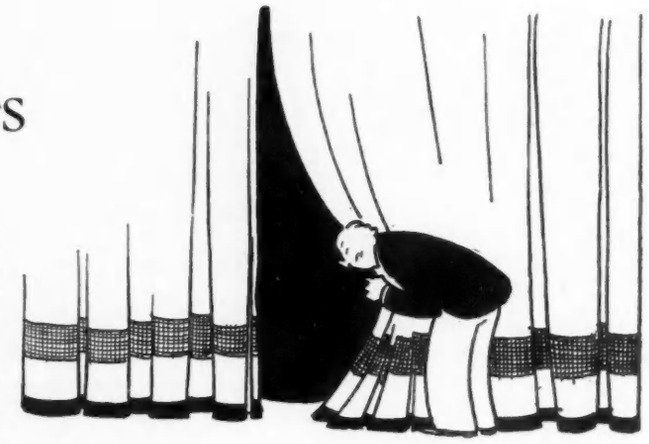
(Public Utility Operations)
April 28-29 Cleveland, Ohio
Hotel Statler

Summer Meeting

June 12-17
White Sulphur Springs, W. Va.
The Greenbrier

Behind the Scenes

With the Committees



Voltages for Diesels

THE tendency toward an unnecessary variety of voltages for the design of electrical equipment for Diesels was discussed at a conference in Detroit during the Annual Meeting in January by representatives of the battery, electrical-equipment and car manufacturers. The conference tentatively recommended that 12 and 24 volts be adopted as the standard voltages for Diesel installations of the automotive type, it being the opinion that installations for marine and industrial work are usually influenced by local considerations and that the electrical system for them should be selected on the basis of the requirements of individual installations.

The preliminary recommendation cited above will be referred to the Electrical Equipment Division of the Standards Committee and a special subdivision will probably be appointed to work out a complete definite recommendation, including any desirable supplementary informational data.

Storage Batteries

For nearly a year the Electrical Equipment Division, Standards Committee, has carefully analyzed the requirements for storage batteries in modern motor-vehicles and has accordingly revised the SAE Standard to include new types of batteries that are used for original equipment, and in which refined ratings have been included. The general notes on the equipment for and procedure in storage-battery life tests have been rewritten to incorporate modifications these tests have indicated are desirable. These notes will be included in the 1938 edition of the HANDBOOK.

Automotive Lighting

These specifications are among the more important of those issued by the Society and as a result of active review and study, all of them with the exception of the laboratory acceptance test for headlights and for reflex reflectors have been redrafted to include uniform-construction, dust and moisture tests.

In construction test the principal change is to reduce the number of vibrations from 1100 per min. to 750 and to include more definite information in all of the tests as to what constitutes rejectability.

Several changes were made in specifications for electric signal lamps, particularly with reference to visibility distance requirements.

No changes have been made in the headlight specifications or those for reflex reflectors as published in the 1937 HANDBOOK.

Steel Specifications

Changes in the SAE steel specifications and supplementary data as the result of a complete review of them during the past year will be included in the 1938 SAE HANDBOOK. The changes in steel compositions include only cancellation of SAE 4345 in the molybdenum group, and the addition of two new steels designated as SAE 4320 and as X4340. Supplementary data on the heat treatment for SAE 4320 have been added which apply also for SAE steel X4340.

The other major changes in the data accompanying the steel compositions are to bring the test specimen requirements into accord with ASTM specification E8-36, and the hardness tests into accordance with ASTM specification E18-36 and E10-27. In the tests for hardness numbers the scale of Rockwell B numbers was extended both above and below the present table.

Several other detailed modifications were made throughout the specifications including those for automotive gray iron castings, all of which will be included in the new edition of the HANDBOOK.

Action!

- **AN EXHIBIT of special riding-comfort instruments evolved through the sponsorship of the Riding-Comfort Research Committee is being planned for the Summer Meeting.**
- **ROUNDING out the survey of aircraft fuel systems made on the Pacific Coast (as reported on p. 20 of the January SAE JOURNAL), members of the C.F.R. Vapor Lock Inspection Group have made a similar study in eastern aircraft plants.**
- **DIESEL engine manufacturers are being invited to cooperate in obtaining some ratings on full-scale Diesel engines so that work can be started to determine correlation with the present laboratory methods with full-scale results, and to determine the importance of ignition quality in actual service.—Automotive Diesel Fuel Section, C.F.R.**
- **A JOINT program committee, representing the Survey and Motor Fuels Divisions of C.F.R. and the Automotive Survey Committee of the A.P.I., has made plans for 1938 road tests. These have been approved by C.F.R. and await approval of A.P.I.**

Aviation Fuel

The Aviation Fuels Division of C.F.R. has recommended that the C.F.R. Survey Division, Aviation Fuels Group, gather recommendations from aviation-fuel producers, aircraft-engine builders and air-transport operators with the object of drafting revised specifications for aviation fuel which will result in economy of fuel production and aircraft operation. This move was the result of a proposal made at a recent meeting of the Air Transport Association of America.

Stuck Rings

"A ring shall be considered stuck if any part of the ring does not move in or out of its groove when the opposite face of the ring is moved in flush with the land. This definition is based upon what is commonly accepted as a cold stuck ring." This definition was agreed upon by the Crankcase Oil Stability Committee at its Jan. 12 meeting for use in its current test program.

At this meeting the Committee also agreed upon details of test procedure in the interest of producing comparable results in its program of tests on six oils of SAE 40 viscosity and three oils of SAE 60 viscosity.

E.P. Lubricants

It is indicated that the SAE E.P. lubricants testing machine is satisfactory as a "go" and "no go" gage for the powerful type of extreme-pressure lubricants when operated in accordance with the tentative procedure adopted by the Committee at

the 1937 Summer Meeting. This statement is made by a special group appointed by the Committee to analyze test results obtained on three lubricants reported by 20 laboratories operating machines produced in the first two production lots. Whether the revised procedure and the machine will satisfactorily rate the milder type of E.P. lubricants is a matter of further research, according to the Committee.

New Standards Adopted

AT the regular meeting of the General Standards Committee during the SAE Annual Meeting in Detroit, ten division reports on 33 subjects were approved and their approval was later confirmed by the Council. Many of the reports were revisions and in some cases extensions of current standards to bring them up to date. The new specifications adopted are those reported by the following divisions:

Lubricants Division – New classification for transmission and rear axle lubricants was adopted as reported in an accompanying item.

Passenger Car Division – A standard for couplings for passenger-car trailers, and the detail for a standard trailer data plate.

A completely revised specification for leaf springs; including the first specification for coil suspension springs, setting up a uniform practice for their inspection and test.

Screw Threads Division – New tables giving detailed dimensions for the threads on the screw and in the nut for non-standard pitches in class 2 and class 3 fits, for sizes 1⅜ in. to 6 in. inclusive. These tables are extensions of the present tables in the SAE HANDBOOK for sizes up to and including 1½ in.

Tractor Division – Reports on tractor power take-offs and tractor drawbars supersede old specifications and bring the SAE Standards up to date with current tractor practice. These standards will be published as joint standards of the SAE and of the American Society of Agricultural Engineers.

1938 SAE Handbook

All of the revised and new specifications adopted at the Annual Meeting will be included in the 1938 edition of the SAE HANDBOOK that is now being prepared. It will be issued at as early a date as possible.

C.F.R. Finds Vapor Lock Rare in Modern Cars

RECENT data compiled by the Cooperative Fuel Research Committee indicate that vapor lock in 1937 automobiles should be of comparatively rare occurrence where car speeds do not exceed 55 m.p.h. Of 23 different car models represented in the tests, only 5 gave vapor lock on gasolines having Reid vapor pressures below 9 lb. at an atmospheric temperature of 100 deg. fahr. Where higher speeds, and correspondingly higher engine temperatures, were attained in the tests, the vapor pressure limits were somewhat lower, although even then only 6 of the cars showed any signs of vapor lock at vapor pressures below 8 lb. There were no outstanding differences between cars in different price groups.

The data compiled by the Cooperative Fuel Research Committee were submitted partly by the automobile manufacturers and partly by oil refining companies. The tests were made under a variety of representative conditions and showed that vapor lock was most likely to appear during acceleration at full throttle after a stop of a few minutes' duration following driving at high speeds. The vapor pressure limit was defined as the vapor pressure of the gasoline which would just produce incipient vapor lock as indicated by a momentary "cutting

Cooperative Fuel Research Committee Announces New Plan of Organization

Since its organization in 1921, as a joint endeavor of the automotive and petroleum industries, the Cooperative Fuel Research Committee had extended its field of activity until the complication of its sub-committees and sub-subcommittees, up to the fourth prefix, made its organization chart a complicated and unwieldy study, quite unsuited to easy and practical handling of the work of the Committee.

With an increasing realization of the cumbersome structure which had grown up to meet individual needs as they arose with little regard to any fixed plan of organization, the Committee a few months ago appointed the chairmen of its various subcommittees together with the secretary of the Committee, as a group to develop a simplified plan of reorganization, under the chairmanship of Dr. R. P. Anderson.

The following outline, presented in the final report of that group, was adopted as the basis of the Committee's organization chart at its last meeting.

The placing of the work of the Committee in five divisions with the accent on the projects being handled by each division rather than on the personnel in each case, secures the type of committee organization long felt to be desired.

Functional Outline of C.F.R. Committee

I. Motor Fuels Division—H. W. BEST, *chairman*
- A. Detonation Projects—H. W. BEST, *director*
  1. Program; 2. Instrumentation; 3. C.F.R. Engine Modifications; 4. Reproducibility; 5. Laboratory Method; 6. Reference Fuels; 7. Humidity; 8. Altitude; 9. Correlation; 10. Road Test.

II. Aviation Fuels Division—ARTHUR NUTT, *chairman*
- A. Full-Scale Detonation Projects—H. K. CUMMINGS, *director*
  1. Program; 2. Engine; 3. Fuel; 4. Analysis.
- B. Laboratory Detonation Projects—T. B. RENDEL, *director*
  1. Program; 2. Instrumentation; 3. Supercharging; 4. Army Method Reproducibility; 5. Laboratory Ratings; 6. Engine Conditions.
- C. Vapor Lock Projects—O. C. BRIDGEMAN, *director*
  1. Program; 2. Inspection.

III. Automotive Diesel Fuels Division—T. B. RENDEL, *chairman*
- A. Ignition Quality Projects—T. B. RENDEL, *director*
  1. Program; 2. Instrumentation; 3. Fuel Injection; 4. Service Engine Rating; 5. Test Engine Modifications.

IV. Non-Petroleum Fuels Division—B. B. BACHMAN, *chairman*

V. Survey Division—J. B. MACAULEY, Jr., *chairman*
- A. Motor Fuels Projects—J. B. MACAULEY, Jr., *director*
  1. Domestic Fuels; 2. Foreign Fuels
- B. Aviation Fuels Projects—A. L. BEALL, *director*
- C. Motor Projects—J. B. MACAULEY, Jr., *director*
  1. Program; 2. Test Procedure; 3. Editorial.

Note: The above outline covers the regular productive functions of the Committee; in addition the existing special committees and those which may be required from time to time will continue to carry on special assignments not covered in the outline.

out" of the engine resulting from momentary failure of fuel to reach the engine. Gasolines having higher vapor pressures would, of course, produce increasingly severe vapor lock, although experience indicated that there was a range of from 3 to 5 lb. in vapor pressure between the limit for incipient vapor lock as defined above and that for vapor lock so severe that the car could not be operated. The actual limit which any individual driver might be expected to find troublesome would probably be between these two limiting forms of vapor lock.

Included in the technical work of the Cooperative Fuel Research Committee is a semi-annual survey of gasolines available throughout the United States. The data for this survey are supplied by oil companies represented on the committee and are compiled for publication and distribution by the United States Bureau of Mines. In the report just issued it appears that 90 per cent of the regular and premium-grade gasolines sold in the summer of 1937 throughout the United States had Reid vapor pressures between 5.3 and 8.7 lb. Thus, for the most part, the 1937 automobiles were in the clear with respect to vapor lock under ordinary driving conditions. As shown by the semi-annual gasoline surveys, the producers of gasoline vary the vapor pressures to meet summer and winter requirements. The advantages to the automobile owner of having available and of being able to use gasoline of the highest practicable vapor pressure are recognized by both the automobile manufacturers and the gasoline producers.

Organized

An informal group which has been doing aircraft-engine-lubricants research work has been organized as the Aircraft Engine Lubricants Research Committee. C. H. Baxley has been appointed chairman.

The three working groups which functioned under the informal organization will continue to study, respectively, engine report forms, used oil-analysis and photographic recording of test results.

Disbanded

Having accomplished the objectives with which it was charged and having no further projects in view the Front Wheel Alignment Research Committee has disbanded with the approval of the General Research Committee.

This move was taken after its last project, a detailed recommended practice for checking the play in a steering mechanism, had been approved. B. J. Lemon was chairman of the Committee.

New Lubricants Classification

The introduction of transmission and rear axle gears having high unit pressures, such as the hypoid type, has led the Lubricants Division to give thorough study for more than two years to the classification for lubricants to meet modern requirements. Accordingly, a new classification for transmission and rear-axle lubricants has been adopted superseding that given on p. 444 of the 1937 SAE Handbook. The new classification which reduces the number of viscosity numbers from five to four, is as follows:

SAE Viscosity Number	Viscosity Range Saybolt Universal	Consistency Must Not Channel in Service at Deg. Fahr.
SAE 80	100,000 sec. at 0 deg. fahr. maximum	−20
SAE 90	800 to 1500 sec. at 100 deg. fahr.	0
SAE 140	120 to 200 sec. at 210 deg. fahr.	+35
SAE 250	200 sec. at 210 deg. fahr. min.	....

This is accompanied by new informational data relative to transmission and axle gears, their proper lubrication, and general application of the new viscosity classification.

The effective date of adoption by the Society of this new classification was Jan. 14 of this year, although there is an optional period of 18 months from then in which the field application of the new classification may be completed. This optional period is in accordance with the policy adopted by the Society in January, 1935.

Octane Requirements of Different Cars Found to Vary

TECHNICAL advances in automobile design and gasoline manufacture have made it highly desirable that the automotive and petroleum industries cooperate in making technical improvements so that users of the products of these two industries will obtain maximum service and satisfaction. The trend toward higher compression ratios in engines, and toward higher octane numbers in fuels, has made it desirable to establish some means of finding out and recording how well current cars and fuels are fitted together with respect to octane requirements. Two years ago the Cooperative Fuel Research Committee, which includes technical representatives of the automotive and petroleum industries and the National Bureau of Standards, first undertook to get information of this character. Each car manufacturer was invited to submit data on the octane requirements of his own products; and, to supplement these data, the other groups represented on the C.F.R. Committee were also invited to submit pertinent data.

The first year's work done in 1936 proved to be largely experimental and was concerned with the development of a suitable procedure. The "Octane Requirement" of a given car was agreed upon to be the octane number of the fuel which would give a trace of knock. People with normal hearing, when they are all together in the same car, will usually agree within a range of one or two octane numbers as to this limit.

The data on octane number requirements obtained during the past year on 24 different makes of cars indicated that there was a considerable spread between different car makes. There was even considerable spread among different cars of the same make. About 30 per cent of the cars irrespective of car make required fuels above 70 octane number for complete freedom from knock for sea level operation. This was without taking advantage of any of the adjustments provided by the car manufacturer to modify the octane requirement. The average requirement for all cars without modification was 66 octane number. There were no outstanding differences between cars in different price groups.

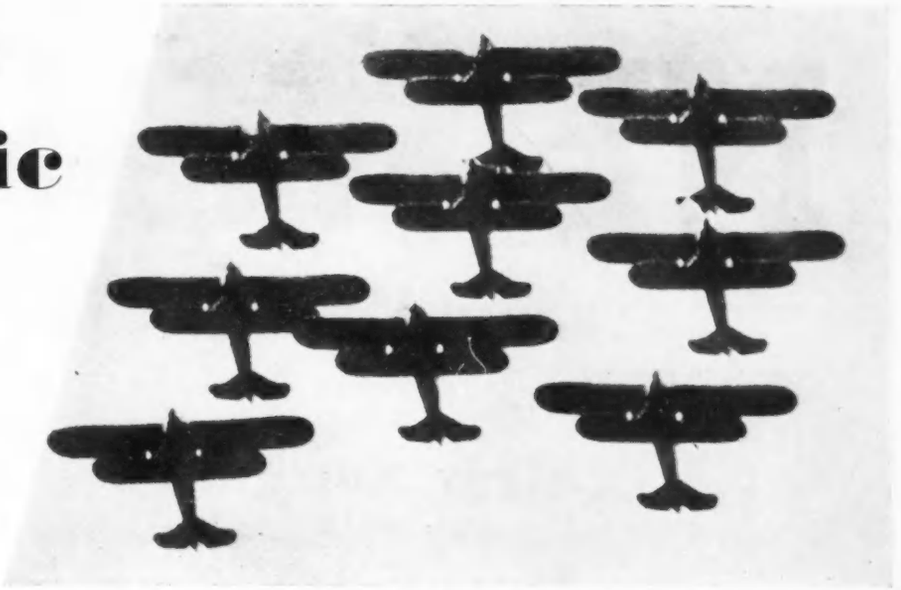
No allowance was made for unusual carbon deposits or scaling in water jackets beyond the stipulation that the cars should have been driven at least 3000 miles prior to the tests.

The tests indicated that the octane requirement was particularly sensitive to spark timing. On the average, one degree in spark advance was equivalent to two octane numbers. The octane requirement of a car, or its tendency to knock on any given fuel was therefore largely dependent upon the initial spark setting and the operation of the automatic advance mechanism in the distributor.

The effect of changes in altitude was such that a change of about 3 octane numbers in octane requirement per inch of mercury change in air pressure was produced in several cars of different make, data for which were reported at sea-level and at altitudes up to 5600 ft. This amounted to roughly a reduction in octane requirement of three octane numbers per 1000 ft. increase in altitude.

Some idea of the scope of these tests can be gathered from the fact that tests were made on 49 different cars representing 25 different models.

SAE National Aeronautic Meeting



Washington, D. C.

March 10 & 11

Sponsored by the SAE and its Washington Section with cooperation of the Aeronautical Chamber of Commerce of America and the Air Transport Association of America

PROGRAM

Thursday, March 10

10:00 A.M. — **Engines**

ROBERT INSLEY, Chairman

Torsional Vibration in In-Line Aircraft Engines – R. M. HAZEN and O. V. MONTIETH, Allison Engineering Co.

Carburetor Icing – ROBERT SANDERS, Engineering & Research Corp.

10:00 A.M. — **Aircraft**

T. P. WRIGHT, Chairman

Bending Stresses in Box Beams as Influenced by Shear Deformation – PAUL KUHN, National Advisory Committee for Aeronautics

Recent Air Commerce Development in Instrument Landing – I. R. METCALF, Bureau of Air Commerce

Ground Training for Instrument Flying – CAPT. CARL J. CRANE, Materiel Division, Wright Field

2:00 P.M. — **Propellers**

R. N. DUBOIS, Chairman

Propeller Problems Imposed by Substratosphere Flight Requirements – C. F. BAKER, Hamilton Standard Propellers

Propeller Factors Tending to Limit Aircraft Engine Powers – G. T. LAMPTON, Lycoming Division, Aviation Manufacturing Corp.

Aerodynamic Considerations Affecting Propellers for Large Aircraft Engines – GEORGE BRADY, Propeller Division, Curtiss Aeroplane Co.

8:00 P.M. — **Small Planes**

J. H. GEISSE, Chairman

Private Flying – LUIS DEFLOREZ, consulting engineer, New York

Engines For Light Airplanes – N. N. TILLEY, Continental Motors Corp.

Friday, March 11

10:00 A.M. — **Transoceanic Flying**

F. W. CALDWELL, Chairman

Operating Characteristics of Large Seaplanes – W. K. EBEL, Glenn L. Martin Co.

Practical Aspects of Transocean Flying – C. H. SCHILDHAUER, Pan American Airways

Afternoon — **Inspection Trips**

GLENN L. MARTIN PLANT – Baltimore

NAVY YARD – Washington

6:30 P.M. — **Reception**

7:00 P.M. — **Dinner**

W. F. BEASLEY, Chairman

W. P. MACCRACKEN, Toastmaster

JUAN T. TRIPPE, Pan American Airways

"America's Position in World Air Commerce"

Tickets: $3.00 each — ***Dress: Optional***

NEWS!!!

about Passenger Car Engineering

FLASH!

First National
Passenger Car Meeting
March 28-30
Hotel Statler . . . Detroit

FLASH!

Alex Taub will tell new things about recent engine developments . . . .

FLASH!

Educated guesses about the direction transmission and gearshift designs will move . . . . backed up by whys . . . . and wherefores . . . .

FLASH!

How will 1939 "ride" differ from 1938's? . . . . the whole story in three stirring acts . . . at *one* session . . . .

FLASH!

New exploration of every phase of body-frame structural elements . . . . possibilities for immediate future . . . .

. . . . and – on Tuesday, March 29 – the Passenger Car Activity Dinner – the speaker, Gen. Hugh S. Johnson! . . . . on Wednesday, March 30, an inspection trip to laboratories and proving grounds.

Mark the dates on your Calendar NOW

MARCH 28-30

Complete program will be mailed to you

News of the Society

Field Editors

Baltimore – Espy W. H. Williams
Buffalo – G. W. Miller
Canadian – Warren B. Hastings
Chicago – Austin W. Stromberg
Cleveland – William G. Piwonka
Dayton – R. H. Henry
Detroit – William F. Sherman
Indiana – Harlow Hyde
Kansas City – No Appointment
Metropolitan – Leslie Peat
Milwaukee – Theodore L. Swansen
New England – J. T. Sullivan
No. California – C. W. Spring
Northwest – R. J. Hutchinson
Oregon – Sid Hammond
Philadelphia – H. E. Blank, Jr.
Pittsburgh – Murray Fahnestock
St. Louis – C. T. Schaefer
So. California – W. G. Chamberlin
So. New England – F. W. Mesinger
Syracuse – C. T. Doman
Washington – Capt. E. L. Cummings

Claims U. S. Lags In Private Flying

● **Philadelphia**

Attracted by a program featuring comments on "Private Flying" by John H. Geisse, chief of the powerplant section of the safety and planning division of the Bureau of Air Commerce, and an informal talk on "Housekeeping in the Clouds" presented by Miss Alberta Tyne, Transcontinental & Western Air's chief hostess, 150 members and guests of the Philadelphia Section, joined by representatives of the "Aircrafters," were on hand for the Feb. 9 session held at the Engineers Club.

Mr. Geisse cautioned the audience that his remarks were to be regarded as "one man's opinion," and proceeded to substantiate his claim that the United States is trailing the world in the development of private flying.

Selecting private automobiles as a convenient means for drawing comparisons to emphasize his statement, he pointed out that: "We lead our nearest competitor, France, in per capita ownership of private planes by a mere 25 per cent. We lead her in the per capita ownership of automobiles by 350 per cent. France leads us by 300 per cent in private airplanes per square mile. We lead Great Britain by 80 per cent in per capita use of airplanes and about 450 per cent in automobiles, but she leads us 500 per cent in airplanes per square mile."

"Why," asked Mr. Geisse, "is our lead in private flying in the order of 25 to 50 per cent while our lead in the use of practically all other conveniences is in the order of 300 to 400 per cent?" He supplied his own answer – that private flying has been fully appreciated as a national asset in all major nations but our own, and in practically all other major nations private flying has been subsidized directly or indirectly. In addition, in all of these countries the Government assists greatly in the development of equipment, he said.

Development of private flying in the United States was summarized by the speaker who concluded that in the handling of private flying little has been done to promote it in this country; except by regulation and he questions its promotional effect.

With regard for steps that could be taken to improve the situation of private flying in this country, Mr. Geisse offered some constructive suggestions. He regards as first and most important among these the provision of better landing facilities, stating "As I visualize the future private pilot, the major airports are the last place he would care to be. For him small fields much more convenient to his home and the places he wishes to visit are important. . . . Landing strips persistently advocated by Schuman Hanks – made a part of our highway system – would be a help.

"Next in importance is probably the development of private flying equipment to make it more attractive to the private pilot. . . . The further development of amphibians and seaplane bases would be a boon to private flying in many sections of the country. Further simplification of the art of flying would help. Reduction in noise and vibration is essential. Reductions in costs would, of course, greatly increase the market."

Mr. Geisse had a good word to say for the Diesel-type aircraft engine. The Diesel, he said, is in an early state of development, and while the performance of present designs might not be outstanding, it holds great possibilities. Not only is its inherent high fuel economy an advantage, but its freedom from fire hazards is a valuable feature, the speaker added.

Fight Depression With Cooperation, Urges Editor

● **Dayton**

Urging that employers and employes throw aside their non-essential differences and settle the problem of "making and keeping business good," John H. Van Deventer, editor of *Iron Age*, spoke before 125 members and guests of the Dayton Section, Jan. 24. Section Chairman Louis F. Poock presided and Harry A. Toulmin, Jr., Dayton patent attorney, was toastmaster.

Neither employers nor labor, as classes, have recognized their common interests or have yet taken those vital steps by which payrolls and profits on investments can be restored and the business depression broken, Mr. Van Deventer declared.

"The grindstone, business, must be made to grind all axes, not just a few, as you cannot expect wage earners to rally 'round the flag and march forward toward better profits for capital and ownership unless there is going to be something in it for them too," he continued.

Mr. Van Deventer expressed his opinion that: "Out of a meeting on common ground of properly motivated employers and employes who are big enough to throw aside their non-essential differences, I can visualize the emergence of a declaration of fundamental principles which might well play as important a part in the future of America as the Declaration of Independence has played in our past. But this would be a declaration of interdependence."

Reveals Accuracy of Precision Flying

● **So. California**

Telling how pre-flight estimates of a plotted transport flight for a 600-mile course can be made with an average accuracy of 5 min., Allan Barrie, senior captain, Western Air Express, spoke at the Jan. 21 meeting of the Southern California Section. With him on the program was Norman Larson, installation engineer, Pratt & Whitney Aircraft, who read the paper: "Flight Testing with an Engine Torque Indicator," which was published in full in the Transactions Section of the SAE JOURNAL for January (pp. 49-62). The paper was prepared by A. Lewis MacClain and Richard S. Buck of Pratt & Whitney, and was originally read at the National Aircraft Production Meeting held in Los Angeles last Fall. Prepared discussion of the paper was presented by Frank Collbohm, research engineer, Douglas Aircraft Co.

Continuing in the presentation of his paper: "Plotted Transport Flight Plan," Captain Barrie explained that when a flight has started and two check points have been passed, the average accuracy, under practical conditions, for estimates ahead is within 30 sec. "For example," he said, "the flight has left Burbank for Salt Lake City. By the time it has arrived over Daggett its estimated arrival at Las Vegas will be accurate within 30 sec. If the flight is non-stop, by the time it has arrived over Las Vegas, which is 250 miles away, estimates over points ahead within a distance of 200 miles again will be accurate within 30 sec."

To obtain this accuracy in precision flying it is necessary to construct a cruising chart showing the true air speed of the airplane through the cruising limits, he explained, adding that from the cruising chart a flight control chart is constructed which includes the time to climb, cruise and descend. In each of these charts, he said, still air conditions are assumed.

Captain Barrie explained that balloon runs, which are taken every six hours by the weather bureau, are used to measure the velocity and direction of the upper air. Wind, he said, may blow from many directions, but its effect on the airplane results in either a head wind or a tail wind. He added that in order to determine the most advantageous altitude it is necessary to work out the plus or minus values of the upper air with a calculator.

Before concluding Captain Barrie showed that, within a year and a half, precision flying has enabled a step up in block-to-block speed of from 154 m.p.h. to 162 m.p.h., or a saving of 8 m.p.h. With 3720 miles per day scheduled,

he computed, this amounts to a saving in operating cost of approximately $1,500 per month. He emphasized, however, that the greatest value of scientific flying is its safety factor. This, he said, is realized during periods of protracted instrument flying by a precision pilot who is able, with flight log and calculator, to report accurately his position and estimate his arrival over check points so that the dispatcher is aware of his location at all times.

Static and Impact Loadings Discussed

● **Northwest**

Pointing out the predominance of impact loadings in automotive service, and the sharp difference in behavior of materials under static and impact loads, particularly in regard to stress concentrations, Prof. B. T. McMinn presented his paper, "Dynamic Loadings; Their Effect on Design and Materials," at the Jan. 14 meeting of the Northwest Section.

Professor McMinn, who is on the faculty of the department of mechanical engineering at the University of Washington, summarized his subject as follows:

"The reaction to a static load is a force and involves strength resistance almost exclusively, while the reaction to an impact load is an absorption of work and involves, among other things, the ability to deflect under load. Thus, the deflection characteristics related to shape and materials become of great importance in impact. . . . Stress concentrations due to any cause have much more violent effects in impact than in static load; hence, the study of factors concerned with stress concentrations are of predominant importance in impact loadings. The most important of these factors are lack of homogeneity, heat treating cracks, cooling stresses and shape."

First Spray Carburetor Built 50 Years Ago

● **Milwaukee**

It was just 50 years ago, in 1888, that the first spray carburetor was built, Frank C. Mock, vice-president of the Bendix Products Corp., told those attending the Feb. 4 meeting of the Milwaukee Section. Prior to this time, he stated, carburetors were of the wick type.

From time to time since then many startling new types of carburetors have been reported, but, he declared, investigation has proved them to be wick carburetors all over again. Mr. Mock added that none of these have proved as successful as the jet type.

Asked why, after all of these years of development, jet carburetors still give trouble, Mr. Mock answered that carburetors require a tolerance and that if this is not considered trouble may result. He pointed out that there is a variation of 6 per cent in engines of identical design, plus another 6 per cent variation in carburetors of the same design, which, when added together, can result in occasional instances where engines may fail to give satisfactory performance. By way of further explanation Mr. Mock noted that a jet will vary in delivery 4 per cent from summer to winter.

After these introductory remarks, W. A. Gebhardt, of the Bendix Products research department, read the paper, "Modern Gasoline Carburetion," jointly prepared by himself, Mr. Mock, E. O. Worth, chief engineer of the company, and A. H. Winkler, of the research department.

The automatic choke, Mr. Gebhardt said, is the greatest development in automotive carburetors in the past five years. He stated that experience has shown that it is much more satisfactory than manual choking.

The chief problem in recent years, Mr. Gebhardt remarked, has been hard starting of hot engines. This, he explained, was due to carburetors acting as percolators because of heat coming from the engine. By keeping the heat away from the fuel lines and by providing heat dams between the manifold and the carburetor body and air vents in the bowl the tendency to percolate has been reduced, he said, adding that the final solution was the anti-percolator jet consisting of an annular space around the main jet which receives the incoming fuel. Many small-diameter holes connect this space with the main jet and these are small enough so that liquid fuel passes easily through them, but fuel vapors are blocked out due to the surface tension of the fuel and vapor mixture, he said.

Another recently solved problem spoken of by Mr. Gebhardt was the stalling of engines on turns. This, he said, resulted when the combination of centrifugal force and car tilt caused the fuel to crowd away from the bowl outlet. The addition of baffles in the bowl keeps the fuel from getting away and has solved the problem, he said.

Tells of Flight Testing Airplanes and Engines

● **Syracuse**

Flight testing of aircraft engines is decidedly different than the flight testing of airplanes, A. Lewis MacClain, chief test pilot of Pratt & Whitney Aircraft, Division of United Aircraft Corp., told more than 300 interested listeners at the Jan. 31 meeting of the Syracuse Section. In flight testing of engines, he said, no attempt is made to tear the wings off the plane as is so often attempted by a pilot testing aircraft construction.

Mr. MacClain traced the development of a new aircraft engine through the various stages which he enumerated as: the conception; the design; the testing; the correction of weaknesses; and finally, the actual flight test. Contrary to general belief, he said, a new engine requires from one to three years of development before it is ready for production.

Explaining the use of thermocouples for the study of cylinder operating temperatures, the speaker said that very often as many as 36 couples are used in an engine to give definite data regarding temperatures in the metal of the various cylinders and at various spots in any given cylinder.

Mr. MacClain stated that the actual time on flight testing is small in comparison to the time required to correlate the data and to evaluate the results obtained from the testing. The actual average flying time, he said, is in the neighborhood of 200 hr. per year, or approximately one hour of flight testing per working day. However, he continued, the data taken from the many delicate instruments are enormous, requiring the attention of an observer as well as that of the pilot.

Skill of Men Vs. Women As Car Drivers Debated

● **Pittsburgh**

A no-decision debate in which Murray Fahnestock matched his statements on the merits of men as car operators against sketches by Mrs. Fahnestock depicting the superior qualities of women as drivers was a high spot of the Pittsburgh Section's annual dinner-dance, Feb. 4. When the sole judge of the event, John A. C. Warner, general manager of the Society, was called upon for his decision, he merely said: "On with the dance."

Approximately 150 members and guests took part in the festivities, and almost all of them participated in dancing the "big apple" at midnight.

Canadians Profit by Tariff, Armer Explains

● **Canadian**

Acknowledging that people of Canada have to pay more for automobiles and other products because of Canada's National Protective Policy, J. C. Armer, vice-president of the Dominion Forge and Stamping Co., Ltd., and of the Canadian Motor Lamp Co., Ltd., told the Jan. 19 meeting of the Canadian Section that if all protective tariffs were discontinued such action would result in directly depriving at least 25 per cent of the present population of Canada of a means of livelihood.

Speaking particularly of the automotive industry, Mr. Armer, who is also chairman of the Automotive Parts Manufacturers' Section of the Canadian Manufacturers' Association, discussed a balance sheet drawn up by auditors of the Canadian Tariff Board to show the value of the industry to Canada in 1934. He said in part:

"This balance sheet shows that it cost Canadians for their cars and trucks in that year $14,000,000 more than they would have paid had there been no duty; but it showed that in return for this $14,000,000 extra expenditure on the part of the purchasers, value to the extent of from $40,000,000 to $47,000,000 was derived by Canadians; giving a net value of from $26,000,00 to $33,000,000 which Canadians received as a result of having the Canadian automobile industry as it existed in 1934." Similar figures compiled for 1936 give a net economic advantage to Canadians of from $43,000,000 to $50,000,000, he added.

Speaking further of 1936 figures Mr. Armer said that about $32,000,000 in wages and salaries were paid by Canadian manufacturers of automobiles and parts directly to their employes that year, and, in addition, $34,000,000 were spent in Canada by these industries for duties, taxes, transportation and other service and expense materials, which amount ultimately is transformed into wages, salaries and other benefits accruing to Canadians.

Continuing, the speaker attributed the large net advantage derived by Canada from the operations of the automotive manufacturing industries to three factors: (1) About one-third of the motor-vehicles produced in Canada are exported and people in other countries, therefore, pay for Canadian labor, materials and other services required in the manufacture of those cars. (2) Certain important automotive parts, such as body stampings and chassis frames, are admitted free because the Tariff Board's investigation showed that Canadian manufacture of these parts would not result in sufficient employment of Canadian labor to recompense Canadians for the higher cost involved. This, he said, insures the importation by Canada from the United States of a class of goods which sound political economy indicates should be imported – a measure which is of economic advantage to both countries. (3) The idea of having a relatively high Canadian content requirement insures the maximum employment of Canadian labor.

Mr. Armer recalled that the Canadian content requirement originated in 1926 at 40 per cent and was later increased to 50 per cent. In 1936 for the large producers of vehicles it was increased to 60 per cent and in 1938, for the same class, it will be 65 per cent. He explained that small producers can qualify with 50 per cent and 40 per cent content under certain conditions.

The speaker is a past-chairman of the Canadian Section. More than 100 were on hand at the Royal York Hotel, Toronto, to hear his address which was entitled, "Net Economic Value of the Automotive Industry to Canada."

Injection System Called Heart of Diesel Engine

● Metropolitan

Metropolitan Section's largest meeting in eight years heard the injection system of Diesel engines called the heart of the compression-ignition powerplants by H. C. Edwards and other speakers at the Feb. 8 meeting.

Describing the research, development, and manufacturing work of the Timken Roller Bearing Co. in the field of Diesel injectors, Mr. Edwards pointed out that fuel systems should be built in such a way as to facilitate their assembly on either side of the engine to operate in either direction.

The speaker cited the four important arrangements of fuel pump drives and mountings. They are: (1) Mounting the pump and nozzle for each cylinder; (2) Assembly of all pumping units in one housing, which also contains the actuating means or camshaft; (3) Flange mounting, where the drive is entirely enclosed by a flange which is attached to one end of the pump, mating with a corresponding flange on the engine. The weight of the pump is overhung from the flange; (4) Pump application is combined with the nozzle mounting.

All four of the general types include injection pump, primary supply pump, nozzle, pressure relief valve, fuel filter, governor, injection timing mechanism, and drive coupling. Timing mechanism and coupling must be built into the engine on the first and fourth type of mountings mentioned above.

The most expensive parts to manufacture, Mr. Edwards said, are the barrel and the plunger of the injection pump because these require precise design and accurate machining, and must be so designed as to make them easy to tear down and assemble.

During the discussion Mr. Edwards pointed out that in the Timken injector system nozzles operate at between 1,000 and 3,000 lb. static pressure. The clearances are between 30 and 50 millionths clearance, and are finished by lapping.

He pointed out that the supply pump must be carefully sealed against the possibility of any air entering the fuel system at any of the tube connections on the suction side.

Cooling the nozzle holders and valves is an important function, and fuel must be carefully filtered before being passed on to the pump, he said. All particles over 0.003 in. must be removed, and Timken engineers have found it advisable to have the fuel pass through a sediment bulb which separates water and a certain amount of small particles. The fuel, in one type of pump, is again filtered in a combination cloth and metal device, Mr. Edwards explained.

"It is impossible to do too good a job of removing all foreign matter from the fuel," the speaker said.

W. J. Cumming, vice-chairman of the Section's Diesel activity, introduced Max H. Schachner, assistant sales manager of the Winton Engine Division, General Motors Corp., to answer questions regarding the company's Diesel units. His remarks were in confidence.

S. P. Marley, Socony-Vacuum Oil Co., Inc., discussed with slides the surge existing in high-pressure fuel lines.

Says Proper Lubrication Keeps Repair Costs Low

More than 225 members and guests attending the Practical Lubrication meeting of the Metropolitan Section Jan. 21 heard a lively symposium on research, design, and application phases of oil filtration as an integral part of the lubrication problem.

A. George W. Brown, equipment engineer, Jamaica Buses, Inc., in discussing lubrication of a bus fleet, declared that proper lubrication, in itself, solves half of the maintenance problems. His company, he said, operates 59 buses that run up a total of 2,106,572 miles, and consume 680,635 gal. of gasoline, and 10,580 gal. of oil per year.

"Astounding savings in repair costs can be made if operators do everything in their power to keep lubricating oil clean," Mr. Brown said. Air control shutters, installed on the radiators or hood panels, have aided materially in keeping repair costs low, he reported.

Stating that his company has bought all types of filters and replacement units, Mr. Brown reported that:

(a) Rigid units are far more effective than those requiring mounting in some delicate fashion; and (b) Filter replacement units manufactured in the garages, at a cost of about 23 cents each, are just as effective as more costly units obtained from manufacturers. Long fibre cotton waste, bought from a filter manufacturer, and hosiery material for the bags, suffice, he said.

In his company, he declared, the following checkup routine is a rigid rule:

(1) Upon return to the garage of each bus, irrespective of mileage, gasoline and oil consumption is checked. (2) Daily checking of all component units for necessary lubrication. (3) At 2000 miles, each bus is consigned to the shop for complete and systematic check of all units.

Wellington R. Graham, assistant chief engineer, Motor Improvements, Inc., read a paper on "The History of Oil Filtration." He pointed out that a standard filter test is needed in the industry and explained that there is need of adding certain solids to the oil in a running engine to take the place of beneficial elements of oil removed by filtration.

Pointing out that the SAE has established standard filter mountings, Mr. Graham urged that all manufacturers use these standards for the convenience and saving of vehicle users.

George A. Round, automotive engineer, Socony-Vacuum Oil Co., Inc., told the meeting that there is no substitute for quality lubricating oil. He also commended fleet operators and equipment companies for the research work they have done to improve vehicle lubrication.

Mr. Round and the other speakers discussed the question of "when to change oil" at considerable length, agreeing that conditions of individual operation, quality of oil, and type of equipment constituted variables which made any general rule impossible.

Some oil reclaiming processes, Mr. Round pointed out, are doing a "tailor-made job" and producing a product of merit. In general, he believed, the nearer the oil reclaiming process duplicates the manufacturing technique of oil refiners the better the reclaimed oil will be.

Maurice Walter, Section vice-chairman for fuels and lubricants, presided at the meeting. Upon his call for discussion Chase Donaldson, vice-president, Briggs Clarifier Co., spoke on the fuller's earth type of filter which, he said, removes acids and gums as well as foreign particles in the oil.

A number of discussers agreed with T. Edward Aldham, Flemming Manufacturing Co., who declared that there should be some standard method for testing oil filters, and described the method used by his company.

Filters for Diesel engines should provide a large market, according to Hegeman McCormack, Transportation Appliance, Inc., who told of tests made with filters on Diesel engines.

In the opinion of William F. Parish, consulting engineer, short sighted policies of filter manufacturers in striving to market cheap filters has resulted in the largest manufacturer of engines in this country refusing to adopt filters as standard equipment, and the discontinuing of filters by the second largest engine maker.

Others taking leading parts in the discussion included: Pierce T. Wetter, consulting engineer; H. Perry Smith, W.G.B. Oil Clarifier, Inc.; Sid Harris, Macmillan Petroleum Corp.; S. P. Marley, Socony-Vacuum Oil Co., Inc.; and T. Edward Aldham, Flemming Manufacturing Co.

SAE National

TRACTOR MEETING

■

Milwaukee

Schroeder Hotel

April 14 and 15

■

Complete Program will be Published in April SAE Journal.

New Surface Structure of Piston-Ring Described

● Indiana

That "Reduction of Piston-Ring and Cylinder Wear" is a crowd-gathering subject when presented by Macy O. Teetor, Perfect Circle Co., aided by motion pictures, was proved for a second time when Mr. Teetor repeated his Annual Meeting paper for the Indiana Section on Feb. 10.

Although the paper and accompanying motion picture took only thirty-five minutes, the discussion kept the speaker busy answering questions for another hour.

Mr. Teetor demonstrated that wear of piston-rings and cylinders can be reduced by a change in the surface structure of the piston-ring, one-half thousandth of an inch deep. He pointed out that a metal that will not completely resist abrasion is desirable and the abraded particles should for best results, break down into fine particles that will tend to polish the parts. He showed that, even during the wear-in period with such improved structures polishing begins, and that it increases after the wear-in is completed. Mr. Teetor concluded, that until it is possible to make piston-rings and cylinders that will be so uniform as to have none of the imperfections of mechanical and thermal distortions that are found today, a certain amount of wear is inevitable.

Dr. Davis Tells Methods of Training Engineers

● So. New England

"Educating the Engineer" was the subject taken by Dr. H. N. Davis, president of Stevens Institute of Technology, when he addressed the Southern New England Section on Feb. 2. Approximately 100 were on hand to hear the speaker, who also holds office as president of the American Society of Mechanical Engineers.

According to Dr. Davis, engineering students

at Stevens are selected more on the basis of tendencies brought to light by questioning than because of more obvious tendencies. In other words, he said, the fact that a boy likes to tinker with an automobile does not assure that he will be a good engineer.

One of the primary factors in training an engineer, the speaker revealed, is to teach the student to think straight. If that is accomplished he will have no difficulty in mastering the general principles, Dr. Davis declared.

At the Jan. 14 meeting of the SAE Council the Southern New England Section officially was made a regular Section of the Society, having successfully completed the usual probationary period through which new sections must pass.

Launches New Type Student Paper Contest

● Cleveland

Launching a new type of Student Paper Contest the Cleveland Section cooperated with the authorities at the Case School of Applied Science in designing a competition that will fit in with the actual college work of the students. It is under the chairmanship of Hoy Stevens, Cleveland Railway Co.

As the contest will correlate closely with the regular course of the technical composition classes at Case, students participating will not be called upon to undertake work in addition to an already full scholastic schedule.

The prize is a $50 scholarship. A wide range of topics is permitted as the paper may be written on "some phase of automotive or aeronautical engineering." Papers must be submitted by May 1, and will be limited to from 1000 to 5000 words. The Governing Board of the Cleveland Section will select the judges for the contest.

Beck Presents Paper and Reviews Annual Meeting

● Baltimore

Past Section Chairman William H. Beck spoke on "Color Research" when the Baltimore Section met on Feb. 3. In it he defined color, described the Munsell and several other systems for tabulating variations in colors and spoke on the relatively new science of color research from chemical and physical points of view.

Before presenting his paper Mr. Beck made a few brief remarks on some of the outstanding papers which were presented at the Society's Annual Meeting in Detroit.

New Car Performance Set As Tune-Up Objective

● Tulsa

Taking "Why a Motor Tune-Up?" for his topic at the Jan. 28 meeting of the Tulsa group, L. L. Fawcett of the Auto Electric Co., Ponca City, Okla., answered his own question with the following statement:

"The main objective in tuning motors is to restore the original performance and economy built into the car by the manufacturer. The car will again deliver its original power and economy if, by repairs or adjustments, we restore the original standards."

Mr. Fawcett declared that to tune motors it is not necessary for the service mechanic to be an automotive engineer and work out a combination of point setting, ignition timing, jet sizes and spark-plug gaps to suit his own ideas; nor to decide the type of coil and condenser capacity required for each particular car. The car and equipment manufacturers, he pointed out, have spent hundreds of thousands of dollars developing these specifications in their laboratories and proving grounds.

All a service man has to do to turn out a satisfactory service job, he said, is to follow a correct series of operations in their proper order and, by use of precision tools, adhere to the tolerances, clearances, and specifications laid down by car and equipment manufacturers.

"When a new car is put in service," Mr. Fawcett continued, "there are several points vitally affecting its economy and performance that immediately begin to wear away from the manufacturer's specifications. These points are the spark-plug gap, the breaker-point gap, the ignition timing, the tappet clearance and the carburetor float setting." He then explained the adjustments necessary to bring these points back to original settings. The first tune-up, he believes, should be made at 4000 miles, providing that the 1500-mile check-up has been made. Subsequent tune-ups should take place at every 3000 miles thereafter.

While new parts are seldom necessary before 10,000 miles, he recommends that after that distance spark plugs and the carburetor-float needle and seat should be replaced. He sets 20,000 miles for the replacement of carburetor jets but does not set any definite mileage for replacing other parts checked in the tune-up.

R. D. Best, B. E. Lowe, D. E. Hamilton and others entered into the discussion of Mr. Fawcett's paper. Mr. Hamilton spoke particularly on the heat range of spark plugs; discussing the effect of blow-by on tip temperatures of spark plugs; pre-ignition and the relation of blow-by to pre-ignition. He also spoke on high-speed and low-speed fouling and the relationship of heat range to compression ratio. Mr. Hamilton was chairman of the meeting and D. G. Proudfoot presided during the discussion.

Section-Regional

T. & M. PUBLIC UTILITY

Meeting

■

Cleveland

Hotel Statler

April 28 and 29

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Under sponsorship of the Cleveland Section and the Transportation & Maintenance Activity.

Section Participates in Western Metals Congress

● So. California

The Southern California Section is one of 18 organizations cooperating in sponsoring the Western Metal Congress and Western Metal Exposition to be held in Los Angeles, March 21-25.

W. E. Powelson, master mechanic, Los Angeles County Fire Department, is representing the Section on the program committee.

Five SAE members are listed as speakers at the meeting. L. F. Scherer, assistant chief engineer, Texas Pipe Line Co., will speak at the petroleum session; T. D. Stay, manager of research, Aluminum Co. of America, at the aeronautics and machinability sessions; J. D. Armour, metallurgist, Union Drawn Steel Co., at the machinability session; and C. L. Cummins, president, Cummins Engine Co., at the session devoted to the latest developments in the metal industry.

Additional Vice-Chairmen Approved for Chicago

Six additional vice-chairmenships for the Chicago Section were approved by the SAE Council at its Jan. 14 meeting. They will represent the following Section Activities: Parts and Accessories; Transportation and Maintenance and Truck, Bus and Railcar; Fuels and Lubricants; Tractor and Industrial Power Equipment and Diesel Engine; Passenger Car (South Bend representative); and Aircraft.

Films Depict Phases of Automotive Industry

● New England

Sound moving pictures dealing with Diesel engines, safety, body making, precision manufacturing, combustion and engine development, made up the educational program enjoyed by New England Section members and guests at a meeting held in Cambridge, Feb. 8. The showing of the pictures followed a dinner and a short business meeting, at which Section Chairman John H. Walsh presided, and a talk on "SAE Activities" by E. F. Lowe, assistant general manager of the Society.

The pictures were presented through the courtesy of the General Motors Corp.

Group Sees Automatic Transmissions Made

● G. M. I.

After hearing H. T. Youngren, chief engineer of the Olds Motor Works, present a paper on automatic transmissions at the Feb. 7 meeting of the Detroit Section, members of the Student Branch at General Motors Institute, who had attended the meeting as a group, devoted an afternoon to a tour of the Buick automatic transmission plant at Flint, Mich., which manufactures automatic transmissions for both Buick and Oldsmobile.

The trip provided an opportunity for the student members to study the various details of design discussed by Mr. Youngren, and, at the same time, to observe the many intricate production problems coincident with the manufacture and assembly of automatic transmissions.

300 Make Merry at Valentine Dinner-Dance

● No. California

A splendid dinner, a dozen specialty vaudeville features and dancing to Cy Trobbe's orchestra made the night of Feb. 5 an outstanding one for 300 members and guests of the Northern California Section. It was the Section's Annual St. Valentine dinner-dance at San Francisco's Hotel Fairmont.

Section Chairman Al Harry LauFer and R. A. Watson were general chairmen of the affair. Working with them were Alfred G. Marshall, Elliott G. Reid, Ulysses A. Patchett, William S. Crowell, Sidney B. Shaw, G. L. Neely, W. G. Thomson, Howard Baxter, C. W. Spring and R. Boelter.

Diesel Called Most Efficient Prime Mover

● **Washington**

Although the Diesel engine is more than 40 years old its performance today, in regard to fuel consumption is practically only 10 per cent more efficient than the first Diesel engine sold to industry in 1898, one speaker told those attending the all-Diesel joint meeting of the Washington Sections of the SAE and the American Society of Mechanical Engineers held Feb. 8. He emphasized, however, that, from a practical standpoint it is the world's most efficient prime mover. Another spoke of the necessity of developing Diesel engines to parallel the performance of gasoline engines if Diesels are to maintain and increase the progress already made. The third speaker, after illustrating the various means of supercharging Diesel engines, observed: "the process of survival of the fittest is applicable to supercharging as well as to men."

O. D. Treiber, chief engineer of the Diesel Division of the Hercules Motors Corp., in presenting the first paper, "High Speed Heavy Duty Diesel Engines in Industry," stated: "If the Diesel engine is to maintain the progress that has already been made, and if this progress is to be increased, the answer to these problems is the providing for the general public Diesel engines which will parallel the gasoline engine. To do this, it is necessary to develop Diesel engines to the point whereby they can be used in the same applications as gasoline engines are now used and wherein their performance will be equal or better, depending on the particular nature of the application. When this is accomplished the demand for Diesel engines will be increased, which will result in the use of production methods which will be helpful in narrowing the cost differential between the two types of engines."

Paul Weeks, Washington manager of the Caterpillar Tractor Co., opened his paper on "Slow and Medium-Speed Diesel Engines" by declaring: "One fact which is amazing is that although over 40 years old the Diesel engine of today is practically only 10 per cent more efficient from a fuel consumption standpoint than the first Diesel engine manufactured and sold to industry in 1898. What, then, has caused the tremendous increase in use of Diesel power? The answer may be stated in one word, *efficiency*. From a practical standpoint the Diesel engine is the world's most efficient prime mover."

Continuing, Mr. Weeks stated: "The years 1929 to 1933, although very distressing to the Diesel engine industry so far as volume of sales was concerned, nevertheless proved to be the necessity which forced those improvements in design which have made the industry outstanding for growth since the depression.

"This period saw the almost complete discard of the air-injection type of fuel injection and its replacement with the type known as solid or mechanical injection of fuel. This was the one single improvement in design which probably reduced engine weights and costs more than any other. The air-compressor of the air-injection engine had used from 8 to 10 per cent of the total power of the engine to drive it, and had accounted for probably as much as 15 to 20 per cent of the total cost and 10 per cent of the weight of the engine, besides being the cause of probably 50 per cent of forced shutdowns of an engine."

E. D. Newell, engineer of the Bureau of Engineering, Navy Department, in discussing "Supercharging of Diesel Engines," stated that supercharging when applied to the Diesel engine, not only increases the available combustion air, but also improves the operation of the engine by removal of the hot residual exhaust gases from the combustion chamber. To accomplish this, he said, the valve timing is so arranged as to hold both the intake and the exhaust valves open for a certain portion of the supercharging period, thereby permitting cool air to scavenge the combustion space and cool the piston, cylinder head and valves. This lowers the temperature of the exhaust gases and further increases the engine output, he explained.

After illustrating various methods of supercharging and applications of supercharged Diesel engines, by means of slides, Mr. Newell concluded by saying: "In conclusion let it be observed that the process of survival of the fittest is applicable to supercharging as well as to men. Time gradually eliminates the less efficient methods and ideas and also develops a large diversity of applications. Supercharging is not a universal remedy but under some operating conditions, such as exist in railroad locomotives and in naval vessels, for instance, where heavy overloads for a short time are inevitable, it has been widely and successfully used and it will continue to be developed."

SAE Papers in Digest

HERE are digests of papers presented at various meetings of the Society.

Some of these papers will be printed in full in the SAE JOURNAL.

Mimeographed copies of *all papers received* will be available, until current supplies are exhausted, at a cost of 25 cents per copy to members; and at 50 cents per copy to non-members, plus 2% sales tax on those delivered in New York City. Orders for mimeographed copies must be accompanied by remittance and should be addressed to Sessions Secretary, Society of Automotive Engineers, 29 West 39th St., New York.

Metropolitan Section-Regional Transportation Meeting – Newark, N. J., Nov. 9-10

Brakes – Can They Take It? – *C. Bockius and John Bassett, Raybestos Division, Raybestos-Manhattan, Inc.*

THIS paper cites some of the abuses of brakes encountered in the hauling industry, and tells how they affect the life of the component parts of the braking system. It recommends the use of a factor, obtained by dividing the gross load of a motor truck or coach by the area of friction material provided by the brakes, to determine whether braking conditions can be considered normal or excessive.

Prevention of Recurring Failures – *J. H. Middlekamp, superintendent of equipment, Brooklyn Bus Corp.*

OUR only means of preventing failures and promoting safety is to maintain vehicles properly. There can be no exact formulas applied to this subject because it is not an exact science. It deals with the coordination of many intangibles.

In the failure of a part of an automotive vehicle there is summed up the evidence of a defect in the coordination of the efforts of all or some of the men responsible for producing and operating the vehicle.

This paper is a brief attempt to untangle the variables involved and place them in the order in which they must be attacked in order to prevent failures at a reasonable cost.

There has been an attempt made to adhere to broad fundamentals and to avoid too much detail due to the limited length of the paper. Consequently, no charts or illustrations are used.

Emphasis has been placed on certain items of maintenance procedure which are sometimes, by error, considered unimportant.

It is expected that the order in which this paper is presented will invite the kind of a discussion between manufacturers and operators which will be beneficial to both, and promote a better coordination of effort toward the elimination of failures.

Fleet History as a Guide to Maintenance – *W. J. Cumming, Surface Transportation Corp.*

(Paper published in full, pages 87-88, Transactions Section, Feb. 1938 issue.)

Truck Problems in Tunnel Operation – *Billings Wilson, assistant general manager, The Port of New York Authority.*

THIS paper discusses some of the problems of handling motor-truck traffic through tunnels, specifically the Holland Tunnel and the new Lincoln Tunnel, opened December, 1937, both of which are controlled and operated by The Port of New York Authority. The purpose, operation, and scope of the Port Authority are outlined. The relation of the trend of sizes of motor trucks to tunnel dimensions is explained, and the necessary restrictions in the size and loading of vehicles are outlined. Prohibition of vehicles from the Lincoln Tunnel that cannot maintain a speed of 20 m.p.h., and the provisions for removing trucks from the tunnel rapidly when they break down are described as examples of the measures taken to keep traffic moving fast and to prevent tie-ups.

Development and Trend in Truck Design – *J. A. Anglada, consulting engineer.*

THIS paper contains a general discussion of the trends of truck construction touching upon such subjects as cab-over-engine, six-wheelers, and all wheel-driven vehicles. Comments are made on various parts, such as axles, engines, and so on.

A comparison of English truck design as affected by legal requirements and design, and as affected by S.A.E. proposed standards of weight and size limitations, is included.

Economics of Truck Selection – *Frederick K. Glynn, American Telephone & Telegraph Co.*

(Paper published in full, pages 37-42, Transactions Section, Jan. 1938 issue.)

Semi-Trailers Vs. Six-Wheelers – *John G. Moxey, transportation engineer, Sun Oil Co.*

(Paper published in full, pages 77-86, Transactions Section, Feb. 1938 issue.)

About SAE Members:

Dr. E. E. Wachsmuth has been connected with the Leipzig Trade Fair, Inc., since Feb. 1 in the capacity of consulting engineer. He will be located in New York. Dr. Wachsmuth was previously technical advisor, Revere Copper & Brass, Inc.

Edwin L. Allen has resigned as chief engineer of the Auburn Automobile Co., Connersville, Ind. He had been with the company since 1928 in the capacities of chief body draftsman, body engineer and chief engineer. For eight years prior to his connection with Auburn, Mr. Allen was engaged in body engineering work for Chandler of Cleveland. He has taken part in the work of the SAE Passenger-Car Body Committee and in Section activities.

Frederic Boyes, formerly with the P. R. Mallory Co., Indianapolis, is now affiliated with the H. A. Wilson Co. of Newark, N. J.

Robert E. Manley, president and chief engineer of the Manley Products Corp., York, Pa., has announced that the company's name has been changed to Remco Products Corp. Mr. Manley founded the company in 1933.

Charles L. Lawrance has been elected an honorary member of the Yale chapter of

C. L. Lawrance
Honored

Sigma Xi, national honorary scientific fraternity. This honor is occasionally accorded to an alumnus of outstanding accomplishments in science. Mr. Lawrance, who is president of the Lawrance Engineering & Research Corp., is best known for his work in the development of radial, air-cooled engines. It was an engine of his design, the Wright Whirlwind, that carried Charles A. Lindbergh on his solo flight across the Atlantic in 1927.

Orrel A. Parker, Parker Wheel Co., Cleveland, has turned his file of SAE Transactions over to the mechanical engineering department of Fenn College.

SAE Men Participate In Aeronautical Program

When the Institute of the Aeronautical Sciences held its sixth Annual Meeting at the Pupin Physics Laboratories, Columbia University, New York, Jan. 24-27, eleven SAE members took part in the program.

Presiding at sessions were C. J. McCarthy, Charles H. Colvin, J. C. Hunsaker, Dr. George W. Lewis and C. F. Taylor.

H. V. Thaden, Alexander Klemin, C. S. Draper, Arthur Nutt, George A. Page, J. C. Hunsaker and W. F. Gerhardt were SAE members presenting papers.

Clarence C. Stevens, mechanical superintendent, New Departure Division, General Motors Corp., spoke before the New York-New Jersey chapter of the American Society of Tool Engineers in Newark, N. J., early last month.

J. R. Sabina, formerly supervisor of the automotive laboratory of Atlantic Refining Co., Philadelphia, is now affiliated with E. I. duPont de Nemours & Co., Inc., Wilmington, Del., in charge of petroleum chemicals laboratory.

A. W. Morton
Elected
Vice-President

Allen W. Morton has been elected a vice-president of the Koppers Co., Pittsburgh. He will continue in charge of Koppers' American Hammered Piston Ring Division at Baltimore, where he has been general manager. Mr. Morton was graduated as a civil engineer from the University of Virginia in 1916. That year he was employed by the Bartlett Hayward Co., Baltimore, now a division of Koppers. Later he became associated with the American Hammered division.

Otto C. W. Henze is affiliated with Robert T. Pollock, consulting engineer, New York, as designer for business machines.

N. A. Jorgensen, who has been manager of the Chicago branch, Gar Wood Industries, Inc., for a number of years, has been transferred

N. A. Jorgensen
Transferred

to New York as manager of the Gar Wood branch located at Long Island City.

Alfred P. Sloan, Jr., chairman of the board of General Motors Corp., has made a $25,000 contribution to traffic safety. The money – the largest personal contribution ever made in this country for this purpose – is being given to the Automotive Safety Foundation by Mr. Sloan as a tangible expression of his high personal regard for *Paul G. Hoffman,* president of the foundation, and for Mr. Hoffman's safety activities over a period of years.

Eugene E. Wilson, United Aircraft Corp., has been elected a vice-president of the Manufacturers Aircraft Association.

Harold V. Nutt, formerly vice-president of the U. S. Diesel Corp., Allston, Mass., is now

Harold V. Nutt
Makes Change

located at the United States Naval Engineering Experimental Station, Annapolis, Md., as mechanical engineer specializing on Diesels. Mr. Nutt is a past-chairman of the Chicago Section.

Leighton W. Rogers was recently re-elected president of the Aeronautical Chamber of Commerce of America, Inc. Walter Beech, president of the Beech Aircraft Co., was named one of the Chamber's vice-presidents.

Robert H. Stier, vice-president of operations, Philadelphia Rapid Transit Co., was a speaker at the Winter Convention of the American Institute of Electrical Engineers held in New York, Jan. 24-28. His subject was "Operating Experiences with Gas-Electric-Drive Motor Buses."

W. H. Righter is owner and chief engineer of the Righter Manufacturing Co., Glendale, Calif., engaged in consulting engineering, engine design and manufacturing.

Charles F. Kettering, director of General Motors Research Laboratory, will give the principal address at a symposium devoted to the many applications of the science of physics in the automotive industry, sponsored by the American Institute of Physics, to be held at the University of Michigan, March 14-15. K. T. Keller, president of Chrysler Corp., is another SAE member scheduled to speak.

On A.S.T.M. Program

Ralph E. Flanders, president, Jones & Lamson Machine Co., will be the principal speaker at the annual dinner of the American Society of Tool Engineers which will be held during the Society's first annual convention, Detroit, March 9-12.

SAE members presenting papers at the technical sessions include Harry T. Woolson, past-president of the SAE and executive engineer of Chrysler Corp.; Dr. E. J. Abbott, president of Physicists Research Co., and A. H. D'Arcambal, consulting metallurgist, Pratt & Whitney Co.

Matschoss Retires as Director of VDI

After 32 years of activity in the Verein Deutscher Ingenieure (Society of German Engineers), Conrad Matschoss has retired from his post as director. Herr Matschoss, who is taking this step at his own request, will serve as a member of the committee of the general Society and will further the interests of the Society with his counsel.

The new director, Herr Stadtbaurat Dr. Hans Kolzow, who assumed office on Jan. 1 of this year, has been acquainting himself with the business of the Society since last October.

. . . . At Home and Abroad

T. P. Wright Elected President of I. A. S.

T. P. Wright, vice-president in charge of engineering, Curtiss-Wright Corp., was elected president of the Institute of the Aeronautical Sciences at its Annual Meeting held in New York late in January. Mr. Wright is active in the SAE and was vice-president of the Society representing its Aircraft Activity in 1934.

SAE members Sherman M. Fairchild, president, Fairchild Engine & Airplane Corp; William Littlewood, vice-president, American Airlines, Inc., and George J. Mead, vice-president, United Aircraft Corp., were among the five new vice-presidents elected by the Society.

E. E. Wilson, senior vice-president, United Aircraft Corp., and Arthur Nutt, vice-president, Wright Aeronautical Corp., are SAE members newly elected to the Institute's Council. Elmer A. Sperry, Jr., Sperry Products, Inc., has been elected treasurer.

Arthur W. Soutter has joined the Worthington Pump & Machinery Corp., Holyoke, Mass., as assistant chief engineer, compressor division. He was formerly research engineer with Gilbert & Barker Manufacturing Co., West Springfield, Mass.

Harry R. Carr, who was in the final assembly department, Wright Aeronautical Corp., Paterson, N. J., is field engineer for the United States Department of Agriculture, Bureau of Biological Survey, Omaha, Neb.

R. O. Erickson, manager, lubrication and industrial sales, Shell Petroleum Corp., has had his headquarters transferred from Detroit to Des Moines.

Leroy R. Ruoff, formerly sales engineer for the Detroit Compensating Axle Corp., located at Long Island City, N. Y., has joined the Interborough Truck Equipment Co., Inc., of the same city, as salesman.

Forrest L. Johnson has joined the Curtiss-Wright Corp., Robertson, Mo., as tool die designer. He was previously superintendent, Alexander Milburn Co., Baltimore, Md.

F. L. Johnson
To Curtiss-Wright

John W. Hobbs has severed his connection with the George W. Borg Corp., Chicago, of which he was vice-president and director. Mr. Hobbs is designer of the Borg electric clock and is credited, in the industry, with popularizing electric clocks for automobile use.

William L. Batt, president of SKF Industries, Philadelphia, addressed the National Management Council at its annual dinner held in New York early last month. Mr. Batt spoke as chairman of a co-ordinating committee which is preparing for the seventh International Management Congress to be held in Washington, Sept. 19-23.

2000 Changes in 1938 SAE Roster

Now off the press, the 1938 SAE Roster is being mailed to all SAE members who have made known their desire to have a copy. The new Roster obsoletes the 1937 edition as it includes some 2000 changes of titles, addresses, or company connections of members.

Besides listing all members of the Society alphabetically and by companies, the SAE Roster also lists National and Section officers, technical and general committee memberships and gives other general information about the Society.

Leon L. Douglas has joined the Bell Aircraft Corp., Buffalo, New York, as engineer.

Robert V. L. Boname is in charge of the technical department of Compagnie Air France-Transatlantique, Paris, France. Prior to his present affiliation he was project engineer, research bureau, Avion Breguet, located in Paris.

R. V. L. Boname
Technical Director

W. R. Spiller, former chief engineer of the White Motor Co., Cleveland, is now connected with the Erie Malleable Iron Co., Erie, Pa., in a consulting capacity. Before this change he had been with White for fifteen years in various engineering positions.

W. R. Spiller
New Connection

Ralph E. Flanders, president, Jones & Lamson Machine Co., Springfield, Vt., has been elected a vice-president of the American Engineering Council.

Arthur E. Benson has been named manager of the development engineering department of the Fisk Rubber Co. He has been affiliated with the company since 1927.

Joseph Geschelin, Detroit technical editor, Chilton Publications, addressed the Mallory Engineers Club in Indianapolis, Feb. 8. His talk was a discussion of modern production methods.

Harvey S. Firestone

Harvey S. Firestone, chairman of the board of Firestone Tire & Rubber Co., died Feb. 7 of coronary thrombosis at his estate near Miami Beach, Fla. He was 69 years old. Since 1912 Mr. Firestone represented his company (an affiliate member) on the rolls of the SAE.

Starting life as the son of a prosperous farmer he deserted the farm to turn to commerce for his livelihood. After studying at the Spencerian School of Commercial Accounts and Finance in Cleveland, Mr. Firestone first worked for a coal dealer who failed, and then turned to selling flavoring extracts and patent medicines. His next venture was in selling buggies.

Seeing that rubber buggy tires were the coming thing he and a partner each put up $1,000 and started a company to make them in 1896. Nine years later he sold 2000 of his first automobile tires to Henry Ford for $55 a set. Thirty years afterward he was head of the Firestone Tire & Rubber Co. which was producing about a quarter of all the tires used in the nation.

Mr. Firestone was instrumental in organizing the rubber division of the War Industries Board during the World War and from 1916 to 1918 served as president of the Rubber Association of America.

Forrest Heath

Forrest Heath, prominent inventor, died recently of a heart attack while driving his car near his home in Upper Montclair, N. J. He was born in South Woodbury, Vt., sixty-three years ago.

In 1903 Mr. Heath began his research work on design of carburetion as applied to two- and four-cycle, hydro-carbon motors. He designed the "Heath Dry-Gas" carburetor and the "Homo" mechanical mixing attachment for carburetors with which Ralph de Palma made a new series of speed records with the Fiat Cyclone during the racing season of 1910.

Mr. Heath later devoted his researches to the domestic oil burner and is credited as one of three inventors of the silent-automatic oil burner. The Timken Detroit Axle Co. purchased the rights of the oil burner and Mr. Heath served with them in an advisory capacity. For the past eight months he had been experimenting on a carburetor of a new type designed to reduce the fuel consumption of trucks.

Paul K. Rogers

Paul K. Rogers, president and treasurer of the Skinner Chuck Co., New Britain, Conn., accidentally fell from a fourth story window of the factory and died before reaching the hospital. He was 48 years old.

Mr. Rogers went to work for the Skinner company after leaving Princeton University in 1907, and worked his way up through the cost, purchasing and bookkeeping departments. He was treasurer for many years and became president in 1931. He joined the SAE the following year.

New Members Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Jan. 15, 1938, and Feb. 15, 1938.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

ALLEN, THERON E. (A) secretary and manager of contest board, American Automobile Assn., 420 Mills Bldg., Washington, D. C.

ANDERSON, MARSHALL SYLVESTER (A) tractor and power plant salesman, McCarty-Sherman Motor Co., Denver, Colo. (mail) 1649 S. Pearl St.

AUSTIN, DWIGHT E. (M) engineer, Yellow Truck & Coach Co., Pontiac, Mich. (mail) Box 5, Orchard Lake, Mich.

BALL, THOMAS M. (M) experimental engineer, Chrysler Corp., 12800 Oakland Ave., Highland Park, Mich. (mail) 1409 W. Boston, Detroit, Mich.

BEDDOW, VICTOR JOHN (FM) electrical engineer, Southdown Motor Services, Ltd., 5 Steine St., Brighton, Sussex, England. (mail) 41 Downland Ave., Southwick, Sussex, England.

BIGLEY, HARRY A., JR. (J) lubrication engineer, Gulf Research & Development Co., P. O. Drawer 2038, Pittsburgh, Pa.

BILTON, PERCY (A) managing director, Vigzol Oil Refining Co. (London) Ltd., Bilton House, 113 Park St., London W. 1, England.

BIRD, KENNETH I. (J) inspector, production test, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. (mail) 300 Burnside Ave.

BOES, WALTER W. (A) branch manager, Perfex Corp., Milwaukee, Wis. (mail) 534 Mutual Home Bldg., Dayton, Ohio.

BURKHARD, HARRY (A) sales manager, White Motor Co., 190 Murray St., Newark, N. J.

CHRYSLER, JACK FORKER (A) clerk, New Process Gear Corp., Chrysler Bldg., New York City.

CLAPP, M. ROGER (J) assistant, Purdue University, Dept. of Mechanical Engrg., West Lafayette, Ind.

COMBERIATE, MICHAEL B. (J) inspection, Sperry Gyroscope Co., Brooklyn, N. Y. (mail) 176 Kosciusko St.

CRICK, STEPHEN E. (J) automotive engineer, Contest Board, American Automobile Assn., Pennsylvania & 17th Sts., Washington, D. C.

CRONE, ROY C. (J) mechanical engineer, Texas Co., Drawer F, Beacon, N. Y. (mail) 27 Willow St.

DAVIS, MARVIN WM. (M) sales engineer, Sheffield Gage Corp., Dayton, Ohio. (mail) 1517 E. Third St.

DICKERSON, CHARLES E. S. (A) president, Miami-Dickerson Steel Co., Dayton, Ohio. (mail) P. O. Box 844.

DYCKHOFF, OTTO (FM) Kronenstr. 24, Stuttgart, Germany.

ELLIS, CHESTER A. (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 164 Sixth Ave., Clifton, N. J.

FORD, A. R. (M) general manager, Frost Gear & Forge Div., Clark Equip. Co., Jackson, Mich.

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POOCK, PAUL W. (A) engineer, Sheffield Gage Corp., Dayton, Ohio. (mail) 15832 Kentucky Ave., Detroit, Mich.

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STEELE, WALTER B. (A) service manager, Oak Ridge Buick Co., Tuckahoe, N. Y. (mail) 60 W. Broad St., Mt. Vernon, N. Y.

STICKNEY, WILDER CURTIS (M) assistant engineer, Gulf Research & Development Co., P. O. Drawer 2038, Pittsburgh, Pa.

STORK, WILFORD L. (M) assistant professor, College of the City of New York, 139th St. & Convent Ave., New York City.

SUNDBERG, GUSTAVE L. (M) engineer, Muskegon Piston Ring Co., Muskegon, Mich. (mail) 1790 McGraft St.

SWARTZELL, K. L. R. (FM) fleet service manager, Shanghai Power Co., P. O. Box 404, Shanghai, China.

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VAIL, ROBERT P. (J) instructor, Texas Technological College, Engrg. Div., Lubbock, Texas.

VAN ZEE, BEN G. (M) assistant chief engineer, Tractor & Engine Div., Minneapolis Moline Power Implement Co., Minneapolis, Minn.

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VOGT, ROBERT F. (M) chief consulting engineer, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

WARNER, W. O. (M) president, Warner Aircraft Corp., Detroit, Mich. (mail) 19635 Canterbury Road.

WECKLER, HERMAN L. (M) vice-president, Chrysler Corp., Detroit, Mich. (mail) 845 Edgemont Park, Grosse Pointe Park, Mich.

WENZEL, ALBERT A. (A) vice-president and treasurer, U. S. Hammered Piston Ring Co., Inc., Stirling, N. J. (mail) Stirling, N. J.

WIGHTMAN, HAROLD W. (M) superintendent, automotive maintenance, Public Service Electric & Gas Co., 80 Park Place, Newark, N. J.

WILLSON, R. DUFF (A) vice-president, Lights, Inc., 3509 Avalon Blvd., Los Angeles, Calif.

WRIGHT, CLAUDE EVELYN (A) engineer, Ontario Steel Products Co., Ltd., Gananoque, Ontario, Canada.

YODER, WILLIAM HENRY (M) paint engine supervisor, Fisher Body Corp., Plant 27-7, Cass and Milwaukee, Detroit, Mich. (mail) 3238 Elmhurst Ave.

Applications Received

The applications for membership received between Jan. 15, 1938, and Feb. 15, 1938, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

ANDERSON, H. C., sales engineer, Flintkote Co., New York City.

BANKER, OSCAR HENRY, vice-president, sales and engineering, New Products Corp., Chicago, Ill.

BARTON, RANDALL, Granite Street, Foxboro, Mass.

BLAIR, SIDNEY MARTIN, chief technologist, Trinidad Leaseholds, Ltd., London, England.

BOGEN, JOHN SHEPARD, research engineer, Waukesha Motor Co., Waukesha, Wis.

BOLD, EDWARD, works manager, Walter Sylvester, Ltd., Tunstall, Stoke-on-Trent, England.

BOOTH, PAUL E., branch manager, National Supply Co. of Pa., Indianapolis, Ind.

BROWN, DONALD LAMONT, president, United Aircraft Corp., E. Hartford, Conn.

BURTON, CHARLES ALFRED, maintenance superintendent, Pioneer Paper Stock Co., Philadelphia, Pa.

CAMERON, LELAND HALL, salvage supervisor, General Motors Corp., Cleveland, O.

CARTER, CHESTER F., John Bean Mfg. Co., Lansing, Mich.

CLARK, WILLIAM H., president, Alox Corp., New York City.

CROWLEY, JOHN C., chief engineer, Dill Mfg. Co., Cleveland, O.

CUMBERLAND, IAN HUGH, managing director and president, Spring Service, Ltd., and Bear Equipment and Services, Ltd., Toronto, Ont., Canada.

DAY, DAVID E., assistant to vice-president, Richfield Oil Corp., Los Angeles, Calif.

DECAPUR, WILLIAM, chief draftsman, Twin Coach Co., Kent, O.

DELEHANTY, KENNETH C., director, Delehanty Institute, Vocational Division, New York City.

DELANO, FREDERICK A., tester, General Motors Corp., Cleveland Diesel Div., Cleveland, O.

DESILVA, HARRY R., teacher and WPA administrator, Bureau for Street Traffic Research, Harvard University, Cambridge, Mass.

DICKINSON, SCOTT REDMAN, engineering drafting, Superior Body Co., Lima, O.

DOBSON, FRANKLIN ALVER, project engineer, Canadian Car & Foundry Co., Fort Williams, Ont., Canada.

DODGE, RALPH L., chief engineer, New Process Gear Corp., Syracuse, N. Y.

DUPREE, DAVID, laboratory tester, International Harvester Co., Chicago, Ill.

ELLERBE, S. E., test and sales engineer, Sinclair Refining Co., Atlanta, Ga.

FISHER, WILLIAM HYDE, automotive engineer, Gulf Oil Corp., Atlanta, Ga.

FISK RUBBER CO., Chicopee Falls, Mass.

FITCH, ELLERY R., chief engineer, Bendix Westinghouse Automotive Air Brake Co., Pittsburgh, Pa.

GALBRAITH, MAJOR R. A. H., associate professor of engineering, Royal Military College, Kingston, Ont., Canada.

GROW, ROBERT J., branch manager, Gar Wood Industries, Inc., Baltimore, Md.

GUSTAVSEN, JOHN A., draftsman, Hamilton Standard Propeller Co., E. Hartford, Conn.

HOOKER, HARRY H., assistant chief engineer, Eaton Mfg. Co., Cleveland, O.

HUGHES, GEORGE GRANVILLE, clinic engineer, Ethyl Gasoline Corp., Baltimore, Md.

ISEMAN, JOHN EDWARD 3RD, sales promotion, B. F. Goodrich Co., Philadelphia, Pa.

JONES, JOHN THOMPSON, general manager, Service Analysts, Inc., New York City.

KIRKPATRICK, CLARENCE WARREN, automotive engineer, Sun Oil Co., Toronto, Ont., Canada.

KNOST, MARION F., automotive sales engineer, Gulf Refining Co., New Orleans, La.

KOEBEL, CHARLES J., president, Koebel Diamond Tool Co., Detroit, Mich.

KOELLIKER, WALTER R., service engineering, Scintilla Magneto Co., Inc., Sidney, N. Y.

KUHLMAN, DOUGLAS J., Chicago branch manager, The Heil Co., Chicago, Ill.

LEGALLIEN, CHARLES LOUIS, director, Charles LeGallien, North Sydney, N. S. W., Australia.

LENZ, ARNOLD, assistant manufacturing manager, Chevrolet Motor Division, General Motors Corp., Flint, Mich.

LYLE, HENRY L., service representative, Chevrolet Motor Co., Oklahoma City, Okla.

LYNCH, RAYMOND J., engineer, New Departure Co., Chicago, Ill.

MAAG, O. L., lubrication engineer, Timken Roller Bearing Co., Canton, O.

MAGUIRE, WILLIAM F., sales manager, General Motors Truck & Coach Co., Baltimore, Md.

MCINTYRE, W. D., vice-president and treasurer, Monroe Auto Equipment Co., Monroe, Mich.

MEISTER, GEORGE J., secretary, Meister Bros., Inc., Elizabeth, N. J.

MILLER, J. MUSSER, lubrication engineer, Standard Oil Co., Detroit, Mich.

MURGARD, CARL A., engineer, Precision Spring Corp., Detroit, Mich.

ORR, GLENN H., experimental engineer, General Tire & Rubber Co., Akron, O.

PATTERSON, JAMES R., assistant to manager wholesale sales, General Motors Truck & Coach Division, Pontiac, Mich.

PENROSE, WILLIAM F., general manager, Empire Electric Brake Co., Newark, N. J.

PETRUZZI, CLAUDE E., student, New York University, Bronx, N. Y.

PHELPS, A. W., general manager, Saginaw Steering Gear, Division General Motors, Saginaw, Mich.

PLOEHN, JOHN H., works manager, French & Hecht, Inc., Davenport, Iowa.

RENTZ, EDWARD W., JR., sales engineer, E. J. Becker Co., Detroit, Mich.

RILEY, RUSSELL G., field engineer, Thompson Products, Inc., Cleveland, O.

ROSSMAN, DURWARD, Ethyl Gasoline Corp., Detroit, Mich.

RYAN, WILLIAM JOSEPH, JR., clinic engineer, Ethyl Gasoline Corp., Baltimore, Md.

SARGENT, HERBERT JACKSON, designer, Kollsman Instrument Co., Inc., Elmhurst, N. Y.

SCHAKEL, RAYMOND ANTON, mechanical engineer sales, Diamond Chain & Mfg. Co., Indianapolis, Ind.

SCHULZ, BUFORD F., truck maintenance manager, Delaware Coca Cola Bottling Co., Wilmington, Del.

SHANLEY, F. R., chief engineer, Curtiss Wright Technical Institute of Aeronautics, Glendale, Calif.

SOMES, HOWARD EDWARD, consulting engineer, Budd Wheel Co., Detroit, Mich.

STACHNICK, MARTIN C., foreman, Baltimore Transit Co., Baltimore, Md.

STATE HIGHWAY DEPARTMENT, Hartford, Conn.

STEWART, GEORGE E., general manager, Stewart Motors Truck, Inc., Long Island City, N. Y.

STICA, ALBERT L., body designer, Edward G. Budd Mfg. Co., Detroit, Mich.

SUNDSBAK, JOHN, instructor and chief engineer, Federal Auto Engineering School, Chicago, Ill.

SWIFT, HAROLD M., salesman, Dittmar Mfg. Co., Harvey, Ill.

SYKES, ARTHUR, director, David Brown & Sons (Hudd) Ltd., Park Works, Huddersfield, England.

TAIT, A. R., president and manager, Central Motors, Ltd., Moncton, N. B.

TOGNOLA, TULLIO, research engineer, Scintilla Magneto Co., Inc., Sidney, N. Y.

WALKER, ALFRED RUSSELL, electrical engineer equipment, Illinois Central Railroad Co., Chicago, Ill.

WALL, HAROLD GEORGE, automotive engineer, Texas Oil Co. (Aust.) Ltd., New Zealand.

WALT, GEORGE R., inspector, Whiting Refinery, Standard Oil Co. of Indiana, Whiting, Ind.

WATSON, HUBERT WILSON, inspector of engineering materials, General Motors Corp., Cleveland, O.

WEBB, HERBERT H., assistant to vice-president, Dayton Power & Light Co., Dayton, O.

WHITE, TRESCOTT S., junior engineer, Enterprise Engine Co., San Francisco, Calif.

WHITTA, CECIL VIVIAN, consulting auto engineer, Christchurch, New Zealand.

WICKS, JOHN WILLIAM, assistant to technical officer, London Passenger Transport Board, London, England.

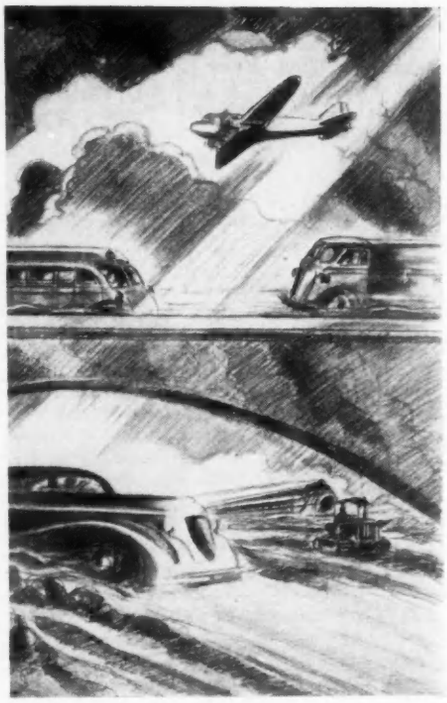
WILLIAMS, GWILYM, director and works manager, James & Co. (Birmingham) Ltd., Halesowen, England.

WILSON, JAMES CALVIN, sales manager, service division, Thompson Products, Ltd., St. Catherines, Ont., Canada.

YOUNG, GERALD P., chemist, Rohm & Haas Co., Philadelphia, Pa.

What

Foreign Technical Writers Are Saying



EVERY month the SAE Research Department covers every important foreign automotive technical publication and prepares these brief, crisp summaries of all articles which have something new or vital to give to automotive engineers outside the country in which they were published.

Scanning of these columns each month will keep you up to date on everything of automotive engineering importance published outside the United States. Other pages of the SAE Journal tell you about domestic developments.

AIRCRAFT

Höhenflug

By A. Weise. Published in *Zeitschrift des Vereines Deutscher Ingenieure,* Oct. 9, 1937, p. 1177. [A-1]

Has high-altitude flying attained technical significance, or is it still in the realm of sporting events? The author asks this question after analyzing the design and performance of the two Bristol, the Caproni and the Potez airplanes in which were made the latest four altitude records. He finds that these planes could not be used in general, practical aviation, since their engines do not develop their full power at high altitudes, their wing loading is from ½ to 1/3 the average value, and the extreme weight reduction needed decreases the fuel supply that can be carried to the minimum required for the ascent and descent. Not only the smallness of the fuel supply, but also the design of the craft, which imposes a low forward speed, would make extended flight in these airplanes impractical.

On the other hand, practical stratospheric aircraft can be developed, if the technical knowledge now available is applied. Multistage, exhaust-driven superchargers and improved cooling are two means suggested for bettering engine performance at high altitudes. Two comparisons are made showing the superiority of high-altitude to low-altitude airplane performance, provided the improvements suggested are adopted. Both airplanes are considered to be alike, except that in each the powerplant is adapted to the flight altitude. The performance features compared are maximum speed and economy of fuel consumption. High altitude flight is said to make possible the combination of great speed, wide range and economy.

To answer the question, can high-altitude airplanes compete with the low-altitude type in the matter of economy, a comparison is made of ideal craft of both types. The conclusion drawn is that for high speed the advantage lies with the high-altitude airplane.

Rescherche des Moyens Propres a Diminuer la Visibilité, donc la Vulnerabilité, des Avions de Bombardement Nocturne

By S. Cantacuzène and M. Véron. Published in *La Technique Moderne,* Sept. 15, 1937, p. 608. [A-1]

The laws of light radiation are brought to bear on the problem of providing a night bombing airplane with the color and finish that will most decidedly diminish its visibility to observers on the ground and in the air. It is assumed that the bomber is being subjected to the play of searchlights from the ground.

For the surfaces visible from below, black, and for those visible from above, a light color are thought preferable. A high polish is judged better than a dull finish. For the highly polished black surface under the play of searchlights the following optical characteristics are claimed: a maximum of absorption, especially for wave lengths perceptible to the human eye; and a minimum of dispersion, even under the maximum angle of incidence of from 60 to 70 deg.

Untersuchungen von Angefachten Dreh-Biege-Tragflügelschwingungen im Windkanal

By H. Voigt. Published in *Luftfahrt-Forschung.* Aug. 20, 1937, p. 427. [A-1]

To test the theory of wing vibration with bending and torsional degrees of freedom, a wing was so hung in the wind tunnel, between two walls, as to be susceptible to both vertical and torsional vibration. The parameter of the suspension and the mass could be altered. The negligible natural damping of the system could be artificially increased. The vibration was recorded on a greatly enlarged scale.

The critical speed determined experimentally agreed with that calculated according to the theory of Wagner and Küssner, within the limits of the accuracy of the test procedure and the methods of calculation. A very narrow wing without side pieces showed the same vibration as with side pieces.

Further investigation will include an especially light wing; a symmetrical trapezoid wing to test its behavior without side pieces and the relation between asymmetrical vertical vibration and torsional vibration, and tests with an aileron to check the theory when there are three degrees of freedom and when the aileron is slotted.

Systematische Profiluntersuchungen in Grossen Windkanal der DVL

By H. Doetsch and M. Kramer. Published in *Luftfahrt-Forschung,* Oct. 12, 1937, p. 480. [A-1]

A systematic investigation of wing profiles was made in the large wind tunnel of the German institute for aeronautical research, specifically with reference to maximum lift with and without the Spreiz flap, and drag at small lift. The series tested included the symmetrical 2 per cent cambered N.A.C.A. profiles 00, 24 and 30, in the range of thickness of from 9 to 21 per cent.

The maximum lift of the profiles without landing aids was confirmed by comparing the results obtained with those of other tunnels for the same practical flying range. To obtain information on the behavior of the profiles with landing aids, the camax measurements were made using a Spreiz flap.

Two methods were used for determining drag at small lift; the usual measurement of forces by means of the balance and the measurement of loss of momentum. Profiles of unusually large chord at high Reynolds numbers were included. The results obtained with and without flaps, over a range of Reynolds numbers corresponding to flight conditions, are presented in curves.

The profiles, with and without flaps, which showed superiority in the two phases investigated are pointed out. The wing performance was found in these tests to be markedly affected by the use of the flap. However, further research is needed to determine to what extent the results obtained with the special flap employed may be applied to other landing aids.

The letters and numbers in brackets following the titles classify the articles into the following divisions and subdivisions: *Divisions*—A, Aircraft; B, Body; C, Chassis Parts; D, Education; E, Engines; F, Highways; G, Material; H, Miscellaneous; I, Motorboat; J, Motorcoach; K, Motor-Truck; L, Passenger Car; M, Tractor. *Subdivisions*—1, Design and Research; 2, Maintenance and Service; 3, Miscellaneous; 4, Operation; 5, Production; 6, Sales.

CHASSIS PARTS

Luftfederung bei Flugzeugen und Kraftfahrzeugen

By Horst Irmer. Published in *Zeitschrift des Vereines Deutscher Ingenieure*, Oct. 9, 1937, p. 1182. [C-1]

Because pneumatic suspension possesses a characteristic requisite for riding comfort, decreasing flexibility with increasing impact, its application has been extended from aircraft to automobiles. Hydraulic damping is used with the pneumatic springing.

Two such systems for aircraft are described, and two for automobiles. A third system, for heavier passenger cars, has no hydraulic damping. In the automotive pneumatic springing-hydraulic damping system, both elements are combined in one cylinder. Two methods for regulating air pressure, manual, by the driver, and automatic, are available. Special detail is given on design features for preventing air and oil leakage. Calculations for design and operating characteristics are set forth.

Stabilité de Route des Voitures à Traction Avant ou à Propulsion Arrière

By de Sèze. Published in *Journal de la Société des Ingénieurs de l'Automobile*, October, 1937, p. 469. [C-1]

The author here analyzes, by a consideration of the forces involved, the effect of driving axle location, front or rear, on the stability of an automobile. Stability is defined as the capacity of an automobile for resisting forces which tend to make it deviate from the path determined by the rolling, without slipping, of its wheels.

That the position of the driving axle, in itself, has no effect on directional stability, is the author's first contention. His reason is that the point at which the force of propulsion may be considered to be applied in either case remains the same with relation to the vehicle, whether the vehicle is traveling on its predetermined path or has been made to deviate from it by some external force. Hence, the motive effort neither emphasizes nor corrects such deviation.

Consideration therefore must be given to the effect of the location of the drawing axle on those factors which do influence stability. Factors which may cause the vehicle to deviate from its path are the external forces to which it is subjected, its weight, air resistance, the vertical and horizontal reaction of the ground, and the inertia reactions set up by its movement. Over against these forces, are the limiting forces of friction, tending to keep the vehicle in its path.

From his analysis, the author concludes that rear wheel propulsion must be freed of the charges of instability and that front wheel traction is not a magic formula for stability. He believes that rear wheel propulsion is logical, since the road adherence at the rear is increased with increase of power and with the addition of the useful load, usually carried at the rear of the vehicle. This supplementary adherence, which, in rear wheel propulsion, is gained when needed, is, under the same circumstances, lost in front wheel traction. To remedy this defect in front wheel traction vehicles, front wheel loading is sometimes increased, with consequent ill effects on steering and tire wear.

ENGINES

Les Machines à Pistons Libres

By Marquis Raoul Pateras Pescara. Published in *Journal de la Société des Ingénieurs de l'Automobile*, July-August-September, 1937, p. 423. [E-1]

The "free piston" machine consists fundamentally of two opposed pistons operating in a single cylinder. They are not connected to any rod, crank or flywheel for the purpose of converting the energy of combustion into useful work, but the useful work performed is the compression of air. Fuel is injected between the two pistons, and its combustion forces the pistons through the cylinder. During the stroke air is admitted into the cylinder through suitable ports and compressed.

Such an engine operates more according to the principles of ballistics than mechanics. Special problems, such as methods for returning the pistons to their starting position after the working stroke, for obtaining stability and synchronization, starting and regulation are discussed. Advantages claimed are simplicity, perfect balance, high efficiency, easy starting, flexibility and economy.

A locomotive is said to be in operation which functions not by steam, but by compressed air furnished by a free piston generator of about 200 hp. A vertical machine used as an industrial compressor is described, as well as a 700 hp. generator furnishing compressed air to a turbine. The free piston machine is thought to be suitable for motor-trucks and airplanes, but not for passenger cars.

Steigerung der Dauerhaltbarkeit von Autokurbelwellen durch Oberflächendrücken des Bohrrandes

By Waldemar Appelt. Published in *Automobiltechnische Zeitschrift*, Oct. 10, 1937, p. 473. [E-5]

To determine whether the durability of crankshafts could be improved by pressure stamping at and near the edges of the oil

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grooves, the investigation here reported was undertaken. Test pieces of two different types of steel were made up in cylindrical form, each having two transverse holes, and surrounding the edges of the holes a flat surface was milled. These were subjected to fatigue tests in a torsional vibration machine.

In untreated test pieces, fatigue cracks started at the inner edge of the hole, and extended at 45 deg. to the axis of the test piece. The holes of certain pieces were then pressure stamped under a slowly increasing load. In these, when subjected to the fatigue test, longitudinal cracks appeared in the transition area from the stamped to the unstamped zone. The increase in durability over the unstamped pieces was 8 per cent. When, in addition to the pressure stamping, the flat surface surrounding the hole was hammered, the durability was increased from 25 to 30 per cent. The type of treatment described is therefore recommended for crankshafts wherever fatigue failures in the neighborhood of the oil grooves are anticipated, due to unfavorable operating conditions.

Ideas in Zinc

To the trained observer of things automotive, the real worth of an automobile depends upon the conception and execution of "hidden" details of construction. True it is that eye-appeal must be there to make the original sale of the car, but in the final analysis the performance and serviceability depend upon details that can't be seen—details that a buyer takes for granted.

One of the most striking examples of this is a zinc alloy die casting developed for 1938 production by A. C. Spark Plug Company. Buried in grease in the steering column housing is a casting of semi-cylindrical form with eccentric bushings fitted at each end. It serves as the mounting for the steering gear worm which is carried in ball bearings in the eccentric bushings. The function of the eccentrics is to provide a quick adjustment for taking up worm wear or clearance in the mechanism due to any cause.

This housing replaces a former design which incorporated the use of a formed sheet metal mounting. Obviously the new part relies upon the unique merits of the modern zinc alloys by way of mechanical strength and stability, both in form and dimensions, under exacting service conditions. Much of the success of this application may be attributed to the development of the high strength, stable Zamak Alloys based on Horse Head Special Zinc of 99.99+ per cent purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 10

MATERIAL

Les Matierès à Base de Résines Synthétiques et la Construction Aéronautique

By R. Hamard. Published in *L'Aéronautique*, October, 1937, p. 231. [G-1]

The development of materials built up on synthetic resins as a basis is discussed. The composition and production of Bakelite, resins reinforced with cloth or with paper, and wood impregnated with resins are treated. A most useful form of such materials is said to be built up of thin layers of wood, glued together under compression, each layer having been previously impregnated with synthetic resin.

A comparative table gives the density, characteristics useful in the calculation of sections, strength and modulus of elasticity of steel, light and ultra-light alloys, spruce, beech, linen, Bakelite, resins reinforced with linen and paper, a synthetic material called Aerolithe and beech impregnated with resin and compressed. The uses in the field of aircraft construction for which these materials, because of their characteristics, are valuable are canvassed, particular emphasis being laid on propeller construction in Germany and France. Transparent resins are said to present interesting possibilities for future development.

Neuere Fortschritte und Erfahrungen im Ausland über die Eigenschaften von Magnesiumlegierungen

By Karl Bungardt. Published in *Luftfahrt-Forschung*, Oct. 12, 1937, p. 527. [G-1]

As a basis of this summary of recent progress and experience in magnesium alloys, there is appended a bibliography of 85 articles, all of which have been published within the last 6 years.

In digesting and quoting from this technical literature, the authors find general agreement as to production and working methods. Within the field of conventional casting alloys, no considerable progress is discernible. Aluminum, zinc and cadmium are used in varying ratios according to the proposed use of the alloy. For forging and pressing, a few alloys having especial merit in this field have been developed. These have as bases magnesium-cadmium, magnesium-cadmium-zinc, magnesium-aluminum-cadmium and magnesium-aluminum-cadmium-zinc.

Recently, the use of silver as an alloying element in casting and forging alloys has been investigated, particularly for the improvement of strength characteristics with reference to yield point. Encouraging results have so far been obtained.

Endurance tests for the satisfactory determination of the heat resistant properties of magnesium alloys are so far lacking. Cobalt and calcium have been found advantageous as alloying elements in improving heat resistance.

In certain binary systems, the solubility of the alloying element in relation to temperature has been determined. Complete investigation of only a few ternary diagrams has been made. Reference to a few important ternary systems is made.

Protection against corrosion is a problem that has not been completely solved.

Prüfung der Laufeigenschaften von Lagermetallen unter Dynamischer Belastung

By Heinz O. Heyer. Published in *Automobiltechnische Zeitschrift*, Nov. 25, p. 551 and Dec. 10, p. 589, 1937. [G-1]

The distinctive feature of the test machine used in the present investigation of bearing metals is that the magnitude and direction of the loads imposed may be varied during a test run. Other conditions of bearing operation in high-speed internal-combustion engines are simulated. A full description is given of the test machine, and of the means for determining and recording the test conditions – bearing play, rubbing speed, temperature, and magnitude and direction of load. Bearing friction was not measured.

Preliminary tests confirmed the correlation between results arrived at in the test engine and those due to running in an actual engine. The condition of babbitt or lead bronze bearing metal after being subjected to 10 million revolutions in the test machine is said to be a reliable basis from which to judge the probable behavior of the metal under service conditions.

Babbitt metal of low tin content crumbled under conditions imposed by the test machine. The formation of cracks seemed to be due to the breaking off of brittle particles as a result of the alternating loads. In a number of lead bronze bearing metals, the relation between wear and lead distribution was investigated. When the lead was finely distributed in round particles, a smooth surface was built up during operation. Where lead particles became separated, small holes with smooth edges were formed. In other types of lead distribution, the loss of the lead particles resulted in crevices, which prevented the formation of a satisfactory running surface.

Finally, an investigation was made with the testing machine to ascertain whether it could be used to determine the effect of more or less intermittent loading on bearing performance.

L'Utilisation du Gaz de Ville Comprime dans les Moteurs d'Automobiles

Published in *La Technique Moderne*, Oct. 15, 1937, p. 690. [G-4]

Previous articles designed to further the use of compressed gas, a domestic product, as fuel for automotive vehicles, have dealt with the technical merits of such gas as fuel and the modification of automotive engines for its use. Production of such gas on a commercial scale, its distribution and methods of making it available to users are the subjects of the present article.

Several types of gas compressor are described, and the conclusion is drawn that robust equipment is available by means of which stations for the compression of gas may be established without great expense. Containers of compressed gas, here prepared, may be distributed to filling stations or directly to vehicles. Operators are urged to give this fuel a trial.

About Authors

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gineer of the Fokker Aircraft Corp. of America and its successor, the General Aviation Manufacturing Corp. A few years ago he rejoined General Motors as engineer on special assignments in the engineering department of Olds Motor Works.

● **G. W. Laurie** ***(M '35) was educated as a mining engineer and was engaged in mining work from 1914 until 1926 with exception of two years in the U. S. Army during the War. In the latter year he entered the employ of the Atlantic Refining Co. in charge of construction equipment, maintenance of measuring and recording instruments, refinery maintenance equipment and refinery transportation. His experience with automotive equipment started with the motorization of the company's teaming department. In 1933 Mr. Laurie was assigned to reorganize the operation of the entire Atlantic truck and passenger car fleet. His present title is manager automotive transportation.***